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# ERRATA.

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Page 43, line 4, for *Bigeloria*, read *Bigelovia*.
" 226, " 21, for speciform, read spiciform.
" 245, " 3, for of the type, read as the type.
" 267, " 13, for T. augustata, read T. angustata.
" 272, " 26, for var. *biennis*, read var. *canescens*.

Vol. III. Part 13.

# PITTONIA.

## A SERIES OF BOTANICAL PAPERS

BY

EDWARD L. GREENE,

*Professor of Botany in the Catholic University of America,*

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## Nomenclature of the Fullers' Teasel.

The Latin names extant and in use for the Fullers' Teasel furnish illustration of the difficulty sometimes confronting the botanist who attempts to apply any arbitrary rule, or set of rules, for determining what binary name ought to be adopted as the right one for a given plant, and also to what author such name, when once settled upon, should be credited. In most of the recent books, including the *Index Kewensis*, the new *Check List* of the plants of the eastern United States, the name of the plant in question is written *Dipsacus fullonum*, L., a name which finds no warrant upon any page of Linnæus save as applied to a plant quite different from the Fullers' Teasel. The type which that author called *D. fullonum*, almost every one since his day has called *D. silvestris*, at least until somewhat recently.

*Dipsacus fullonum*, not of Linnæus, but of most other authors, is rank and copious as a weed in waste lands about San Francisco Bay; and it was while endeavoring to give it a correct citation under that name in my *Bay-Region Manual* that I obtained some notion of the intricacy of its nomenclatorial history. It will be seen by reference to that work, that I found it necessary to attribute the name *D. fullonum* to Miller. In this I was following the usage of the most approved botanical authors of the last hundred years or more. And, inasmuch as Linnæus applied the name *D. fullonum* primarily to what both before his day and since has been called *D. silvestris*, it is a falsification of the Linnæan page to write "*D. fullonum*, L.," when the Fullers' Teasel is meant. At the bottom of the difficulty lies the fact



pl. 13. inclosed from M. S.
Miss Clark.

that Linnæus, erroneously combining as one species two plants which had often been proven distinct, assigned the historic name *fullonum* to the wrong type, and then gave to the true *fullonum* the varietal name *sativus*. To put the case perhaps a little more plainly: the type which all early authors and most later ones had called *silvestris* he awkwardly called *fullonum*, then made the true *fullonum* a variety of that, but under the name *sativus*. Of course, if he had not himself ignored the law of priority; if he had preserved the name *fullonum* for the type to which it had been given in the earliest period of botanical history, he would have done a reasonable and right thing, and there would have been no trouble about writing "*D. fullonum*, L." Or, if he had observed priority in another way, by preserving the old name *silvestris* for that which he so perversely called *D. fullonum*, and then had appended the true *fullonum* to that as a var. *fullonum*, there would have been no difficulty. The two species could have been segregated—as they were and will be—each retaining its proper specific appellation. Fortunately, the best of Linnæus' contemporaries had as little respect for his authority in matters of nomenclature as he himself had for the principle of priority; and Philip Miller at once set right the binary nomenclature of the Teasels under the law of priority; and the task was easy enough. But since then, that has come to pass of which Miller had probably not the least apprehension, that the great majority of leading botanists have made Miller's *Dictionary* the real starting point in the nomenclature of the *Dipsacus* species in question. The following is a selection out of a large number of first-class authors who repudiate the page of Linnæus, either openly citing Miller, or at least using the names as he applied them:

DIPSACUS FULLONUM, Mill. Dict. (1768).
—— —— Mœnch, Meth. 491 (1794).
—— —— Willd. Sp. i. 543 (1798).
—— —— Smith, Fl. Brit. i. 168 (1800).

DIPSACUS FULLONUM, Persoon, Syn. i. 119 (1805).
——— ——— Heller, Fl. Wirceb. i. 161 (1810).
——— ——— Ait. f. Kew. i. 223 (1810).
——— ——— S. F. Gray, Nat. Arr. ii. 425 (1821).
——— ——— Roehl. Deutsch. Fl. i. 737 (1823).
——— ——— Coult. Mem. Genev. 22 (1823).
——— ——— Spreng. Syst. i. 377 (1825).
——— ——— Host. Fl. Austr. i. 184 (1827).
——— ——— Duby, Bot. Gall. i. 258 (1828).
——— ——— DC. Prodr. iv. 645 (1830).
——— ——— Steud. Nom. i. 518 (1840).
——— ——— Ledeb. Fl. Ross. ii. 395 (1844).
——— ——— Babington, Manual, 158 (1851).
——— ——— Bentham, Handb. 231 (1866).

The above list of authors is, I say, very far from complete, and only representative of that great majority who, during the century immediately succeeding the publications of Linnæus and of Miller, have found it necessary to reckon the nomenclature of the common Teasels as beginning with Miller.

The other species, namely the type of Linnæus' *D. fullonum*, is received by the same set of authors—that is, by almost everybody—under the name

DIPSACUS SILVESTRIS, Mill. Dict. (1768).

A question will no doubt here arise in the minds of several readers of this paper, as to why Linnæus' type of his own *D. fullonum* should not bear the name he gave it. Why, in other words, should not one write *D. fullonum*, L., instead of *D. silvestris*, Mill., and then for the other species proceed to write *D. sativus* (L.)—instead of *D. fullonum*, Mill.—where Linnæus put it *D. fullonum*, var. *sativus?* This is exactly the procedure which our so-called Rochester Code requires. Why, in the *Check List*, has not this been done? Why, in that document, is Linnæus so completely falsified as to his

naming of the *Dipsacus* species? The rule is one which would reverse the decisions of all the most learned and critical botanists of botany's most important century cycle. And the reason for the Millerian nomenclature of the species, that which brought it out in the first place, and has gained for it such almost universal adoption by botanists is, that it is necessary to repudiate such recklessness of principle as Linnæus manifested when he took the specific name *fullonum* away from the plant which had borne it for ages, and applied it to one which fullers had never used, which had never been called *fullonum*, but had always had another name. It was as bad a transaction as if, for example, a man bent upon lumping together as one species, *Malus coronaria*, the wild crab apple, and *M. communis*, the orchard kind, perversely taking the wild kind for his type should name it *M. communis*, and then reduce the orchard kind to that as a variety, under the name *M. communis* var. *coronaria*. It is safe to say that no author living would tolerate such an exact transposition of the two names *coronaria* and *communis*. It is running too diametrically counter to the plainest common sense. But it is just this wildness of folly on the part of Linnæus which has caused that repudiation of his *Dipsacus fullonum*, which any one may see has been almost universal. In the *Check List*, by a very easy piece of legerdemain, the thing is put, not as Linnæus put it, but as he ought to have done, and then he is credited as having so done it! This is in violation not only of the Rochester Code, but of every other, not omitting the universal principles of truthfulness and common sense.

Let me here indicate that, while preparing the *Manual* already referred to, though I decided upon following the Millerian nomenclature for the time being, I nevertheless did not fail to see that this would be in violation of one article in the Rochester Code which I most heartily approve, that of the rejection of all homonyms. Certainly *Dipsacus fullonum*, Mill., is a homonym of the *D. fullonum*, Linn. And

there is already a considerable array of botanical authorities who have, perhaps for a number of different considerations, rejected altogether the name *Dipsacus fullonum*. This began while both Linnæus and Miller were still living, as the subjoined bibliographical selections will show. These all have an equivalent in the *D. fullonum* var. *sativus*, Linn.

DIPSACUS SATIVUS, Haller, Hist. Stirp. Helvet. i. 86 (1768).
—— —— Buchoz, Dict. Univ. des Plantes, i. 338 (1770).
—— —— Honckeny, Verz. 374 (1782).
—— —— Krocker, Fl. Siles. i. 218 (1787).
—— —— Chomel, Hist. des Pl. Usuelles, 7 ed. i. 501 (1803).
—— —— Thore, Chloris, 36 (1803).
—— —— Gmelin, Fl. Bad. i. 314 (1805).

All these instances of the employment of *Dipsacus sativus* as the name of the Fullers' Teasel have been culled from within the narrow limits of my own library, with the exception of that credited to Honckeny's *Verzeichniss*; this having been taken by me at second hand from the *Kew Index*. Haller's mention of *D. sativus* may be thought a little obscure. He is treating of indigenous plants; no others being admitted formally into his work. But in a note under *D. silvestris* he mentions *D. sativus* by this name, gives the characters by which it is distinguished from the other, and adds that Linnæus erred in confounding it, as a variety, with *D. silvestris*. And Haller's reinstatement of the species, under the name *sativus*, lacks only a year of being as old as Miller's restoration to it of the still older specific name *fullonum*.

It cannot be assumed that the above list of authors who have thus used the name *D. sativus* is exhaustive. More probably it is only representative; but that is enough for our present purpose. The pertinent question is this: What principle of nomenclature constrained this class of authors, and

especially such original, independent and masterly botanical writers as Haller and Gmelin, to depart from that course of procedure in which Miller had taken the lead, and where almost every one else was following, *i. e.*, the restoring the ancient specific name *fullonum* to the plant which had so long borne it before Linnæus misapplied it?

Many a novice in the study of nomenclature may, I fancy, be ready with the answer that, *sativus* being the first adjective name assigned to this form by Linnæus, it must be taken up for the species, if the variety be accepted in the rank of a species. But this kind of answer can only come out of the recently developed, exaggerated and distorted view of the importance of Linnæus as a botanical nomenclator. Certain it is that the botanists of the times of Haller, Miller, and Gmelin had no such notion of the perpetual sacredness of Linnæan specific or varietal names. If it did not enter into the minds of all those great botanists who so promptly and continuously repudiated the Linnæan misapplication of the name *fullonum* that Linnæan naming was sacred and inviolable, so neither did the other class take up the varietal name *sativus* for any such reason as that Linnæus had given it inviolable sanction. Such notions are very modern: They did not actuate the nomenclators of a hundred and forty years ago. The actual reason for attempting to perpetuate for the Fullers' Teasel the name *D. sativus* will be found in the fact that it had been known by that designation very generally for at least two centuries anterior to the time of Linnæus. The following excerpts from the bibliography of the species in botanical works of the sixteenth, seventeenth, and eighteenth centuries will demonstrate this:

DIPSACUS SATIVUS, Dodoens, Pempt. 723 (1583).
——— ——— Gerarde, Herbal, 1005 (1597).
——— ——— C. Bauh. Pinax, 385 (1623).
——— ——— Johnson, Herbal, 1167 (1633).
——— ——— Park. Theatr. 983 (1640).

DIPSACUS SATIVUS, J. Bauh. Hist. iii. 73 (1651).
—— —— Ray, Catal. 94 (1670).
—— —— Ray, Hist. i. 382 (1686).
—— —— Tourn. Elem. 371 (1694).
—— —— Ray, Synopsis 2 ed. 96 (1696).
—— —— Tourn. Inst. 466 (1700).
—— —— Boerh. Hort. Acad. 133 (1720).
—— —— Ray, Synopsis, 3 ed. 192 (1724).
—— —— Mill. Dict. 2 ed. (1741).
—— —— Ruppius, Fl. Jen. 3 ed. 217 (1745).

So, then, it was not by reason of any wish to follow Linnæus that some of his successors maintained the name *sativus*. The fact was simply this, that up to the time of the publication of the *Species Plantarum*, all botanists of the age had known the plant as *Dipsacus sativus*. It was the old familiar name for the species; and the effort to retain it in spite of Linnæus was but natural, and perfectly so, whether you say they were contending for the principle of priority in plant names, or whether you assert that they were merely impatient of the inconvenience resulting from the suppression of time-honored familiar names.

Yet Miller, the man who after all was the successful opponent of Linnæus in this matter, he who led the way out of the difficulty, did not adopt the name *sativus*, but took another. Why was this? The time was one of great disturbance, upheaval, revolution in matters of botanical nomenclature. This was admitted on all hands, and keenly felt. Our little disturbances of the same sort, here in the end of the nineteenth century, though perhaps offering some problems more complicated, are but slight and hardly felt tremors in comparison with the nomenclatorial shock which occurred to the botany of the middle of the eighteenth. At that time of upheaval, it seems as if it occurred to Philip Miller well to insist upon the retention of a specific name, which was really much older than *sativus*, for this species,

namely, *fullonum.* Linnæus himself had led the way, though he completely perverted the use of *fullonum.* But Miller restored it to the right plant. This may forever stand in the history of botany as a conspicuous early instance of the retention of the oldest specific name, when the species is transferred to another genus. It is most probable that colloquially, and in the manuscript Latin of botany, as it was taught for five or six centuries before the invention of printing, the plant in question was known by the name of *Carduus fullonum.* At least, in the very earliest printed books of botany—books of a generation earlier than those wherein *Dipsacus sativus* is the accepted name—we find it called *Carduus fullonum.*

CARDUUS FULLONUM, Brunfels, ii. 191 (1531).
—— —— Dorsten, Bot. 67 (1540).
—— —— Tragus, Hist. 847 (1552).
—— —— Lobel, Obs. 487 (1570).

Another and a significant item in the history of the Teasel nomenclature is the fact that several authors, none of them of the slip-shod and careless sort, have actually accredited Linnæus as the author of the name *D. silvestris* for the type which he called *fullonum.* Almost universally, as I have said, do authors write *D. silvestris*, Mill.; but we have not only Babington and others as noted as he, but also even Elias Fries, writing *D. silvestris*, L. What warrant can Fries have supposed that he had for this? Linnæus, it will be seen by reference to his page, cites "*D. silvestris*, Dodoens," as the synonym of what he called *D. fullonum.* He also cites "*D. sativus*, Bauh." as the synonym of his *D. fullonum* var. *sativus.* Did Fries and others think Linnæus' meaning and intention to have been that, in case of a segregation of the two which he had combined, those names, *D. silvestris* and *D. sativus*, were to be taken up as their specific names respectively? I cannot but suspect that some warrant for such

a view may be found somewhere in the writings of Linnæus, for Fries was too accurate and too thoroughly a scholar in in every sense of the word ever to have made Linnæus say, *D. silvestris*, where he did not think that author had made provision for it.

Here is certainly a question worthy of being pondered by all who are seriously—not superficially and pedantically, and from artificial, arbitrary initial dates—studying questions of nomenclature. Did Linnæus really expect, for example, that upon the segregation of the two Teasels which he had united, the names *D. silvestris* and *D. sativus* would be resumed for them? If so, then the prevailing usage of writing *D. silvestris* Mill. and *D. fullonum* Mill. should be open to reconsideration from such a point of view. But in no case is there any shadow of a warrant for writing, as is written in the *Kew Index*, and in our newest American list, "*D. fullonum*, L.,"[1] for the Fullers' Teasel.

But, finally, what shall one write as the Latin binary name for the species in question? Miller's proposition is the only acceptable one, it seems to me, for those who do not mind using homonyms. They, however, who reject homonyms, must, it seems, take up the D. SATIVUS, Haller, as the only post-Linnæan appellation enjoying post-Linnæan priority. This name has, in fact, been much longer in use than any other, taking the whole history of the species under a binary nomenclature. Yet, the oldest specific name of all, under a binary nomenclature, is the name *fullonum*. I for one should be glad to know if any author anterior to Linnæus used the combination DIPSACUS FULLONUM; for, by the safe and sound principle of simple priority, a pre-Linnæan use of that combination would save it; and its preservation is eminently desirable.

[1] In the Check List it is erroneously printed "*D. Fullonum*," doubtless through default of knowledge as to what part of speech the word *fullonum* is.

# A Proposed New Genus of Cruciferæ.

Of the family above named there is a considerable group of neat and elegant annuals, belonging to the Mexican and south Californian coasts and islands, the members of which, all of them discovered and brought to the knowledge of botanists within the last decade, have been temporarily referred to almost as many genera, severally, as there are species in the group. The species are six, and in publication they have been distributed among the four genera, *Arabis*, *Cardamine*, *Sisymbrium* and *Nasturtium*; and it is a wonder to me that two of them were not consigned to *Thelypodium*, rather than to any of the others. To the annual species of *Cardamine* having pinnatisect foliage these plants would bear a closer likeness than they do, if they were not all conspicuously glaucous; but they show not the faintest indication of that sudden and elastic dehiscence of the pods which is so essentially characteristic of that genus. Their subterete pods and wingless seeds exclude them totally from *Arabis*, to no one section of which, however, do they bear any general resemblance. There is only one of the species which any one has thought of as possibly referable to *Nasturtium*. There is no rational way of treating such a group but that of conceding to it the rank of a genus, and for this one I propose the anagrammatic name

**SIBARA.**

Slender, erect, sparingly branching glaucous annuals, with leaves usually pinnately divided into very narrow divaricate or retrorse segments. Flowers white or purplish,

small, loosely racemose. Sepals oblong, equal at base, or nearly so. Petals unguiculate, the ample limb spreading. Filaments flattened; anthers linear-sagittate. Pods slender, little compressed, either distinctly beaked or the stigma subsessile. Seeds oval, not winged or margined.

* *Leaves pinnate, the segments very narrow.*

1. S. FILIFOLIA. *Cardamine filifolia*, Greene, Pitt. i. 30. *Arabis filifolia*, Greene, Bull. Cal. Acad. ii. 390; Wats. in Gray, Syn. Fl. i. 159.—Species known only from Santa Cruz Island off the coast of California, where it was first collected by the present writer ten years since.

2. S. PECTINATA. *Arabis pectinata*, Greene, Pitt. i. 287.—From the Bay of San Bartolomé on the peninsula of Lower California.

3. S. ANGELORUM. *Cardamine angelorum*, Wats. Proc. Am. Acad. xxiv. 39.—This also is Lower Californian, but on the Gulf, or eastern shore of the peninsula, and farther north than the habitat of *S. pectinata*. Mr. Watson's surmise as to the generic relationship of this species corresponds to what was my own impression when that which I now place as typical for the new genus first came to my notice.

4. S. LAXA. *Nasturtium* (*?*) *laxum*, Wats. Proc. Am. Acad. xxiv. 39.—Inhabiting the same locality with the preceding; the pods on rather long deflexed pedicels, and also slightly curved; but the plant perfectly congeneric with the foregoing; indeed quite like them in habit, except as being more weak and delicate.

5. S. BRANDEGEANA. *Sisymbrium Brandegeanum*, Rose, U. S. Herb. i. 10.—This is from the western shore of Lower California; has the glaucous foliage of the other species, but the racemes are greatly elongated, the stem and few branches being floriferous from within a few inches of the root. The

subsessile curved and almost torulose pods are more like those of some *Thelypodium ;* yet the plant will readily be admitted to be a strict congener of the type-species of SIBARA.

* * *Leaves not pinnately divided.*

6. S. PALMERI. *Cardamine Palmeri,* Wats. Proc. Am. Acad. xxiv. 38.—Annual and erect, with the habit and the ascending long slender pods of *S. filifolia,* equally pale and glaucous, the long petioles of the rounded and pinnately lobed leaves sparsely hirsute.

It was an almost unaccountable suggestion, that of the late Mr. Watson, that this glaucous annual of a desert seashore, almost within the tropics, could have any relation to that green and flaccid perennial of frigid alpine brooklets, *Cardamine cordifolia.* From certain characteristics of the pod, as well as from the bloom upon the herbage, a relationship with *Thelypodium* might more naturally have been inferred.

## New or Noteworthy Species.—XV.

Ranunculus samolifolius. Stems several from a perennial root, weak, somewhat flexuous and half reclining, 6 to 10 inches long, simple, leafy throughout, with a solitary terminal short-peduncled flower: herbage very light green, nearly or quite glabrous: leaves all entire, obtuse; the radical oblanceolate, long-petioled, 2 to 4 inches long; cauline oval or obovoid, with very short dilated and thin sheath-like petioles: sepals round-ovoid, spreading, thin, deep yellow: petals 5 or 6, broadly and almost truncately obovate, golden yellow: achenes unknown.

A well-marked species of the higher Sierra Nevada, Calif., from Mt. Shasta southward. Although specimens have been coming in from time to time to my herbarium for fifteen years past, I have not seen it growing, and have long hesitated about publishing it, hoping that some one might obtain it in fruit. It has been referred, in the herbaria of others, sometimes to *R. Flammula*, and sometimes to *R. hydrocharoides;* perhaps in some instances to *R. alismellus*.

Ranunculus occidentalis, var. ultramontanus. Stems tufted, slender, ascending or depressed, only 8 or 10 inches high, branching and many-flowered: pubescence sparse, fine and not obvious: leaf-divisions not cuneiform, deeply cleft into lanceolate segments; upper cauline 1 inch long, lanceolate, entire: corolla ½ inch broad; achenes small, tipped with a very short hooked style, and forming a depressed-globose head.

Banks of streams and lakes, or in moist meadow lands along the Truckee River, at the eastern base of the Sierra Nevada, Calif. Completely isolated from all forms of *R.*

*occidentalis* geographically; its nearest ally being var. *Eisenii*, which, however, is of dry wooded hills, on the western slope of the Sierra only.

RANUNCULUS OCCIDENTALIS, var. HOWELLII. Resembling the var. *Eisenii* in appearance, but the leaf-divisions more repeatedly and deeply cleft, and all the lower leaves canescent with a long appressed silky pubescence: achenes rather small, tipped with a slenderly subulate merely somewhat curved or almost straight elongated style.

Dry hills near Ashland, Oregon, 1889; collected by Mr. Howell, who, familiar with genuine *R. occidentalis*, could not refer his plant to that species, but distributed it as being, in his opinion, probably *R. canus*. In character of achene it is very unlike *R. occidentalis* or any of its subspecies.

RANUNCULUS OCCIDENTALIS, var. BREVISTYLUS. Leaves thinnish and flacid, the whole plant appearing glabrous, only obscurely pubescent under a lens: petals oblong-obovate: achenes tipped with an extremely short recurved style.

Shores of Yes Bay, Alaska, 1895, Mr. Howell. Petals broader than in other varieties or subspecies of *R. occidentalis;* but from its foliage, and general aspect, the plant can not be referred elsewhere; though it may eventually prove to be a distinct species.

RANUNCULUS POPULAGO, Greene, Eryth. iii. 19, has a synonym in *R. Cusickii*, Jones, Proc. Calif. Acad. n. ser. v. 615. Cusick's number 1161 is also my type of the species.

DELPHINIUM COGNATUM. Stems erect, simple, sparingly leafy, 2 feet high from a fascicle of elongated and slender almost fleshy-fibrous roots; herbage pale and glaucescent, the lower face of the cuneately parted leaves, and also the petioles, floral bracts, spur of the calyx and even the follicles more or less pilose-pubescent: raceme elongated and rather

loose: upper petals white, the flower otherwise of a clear blue.

At middle altitudes of the West Humboldt Mountains, Nevada, in dry rocky soil in the shade of junipers, collected by the writer in July, 1894. Species with something of the aspect of *D. Columbianum*, that is, *D. pauciflorum*, Nutt.; but the roots of that are almost round-tuberiform; so that the present plant is more allied to *D. scaposum*, to which, however, it bears less general resemblance.

DELPHINIUM GRACILENTUM. Slender, usually 2 feet high or more, from a grumous-tuberiform root, sparsely leafy, pale green and glaucescent, appearing glabrous, a lens revealing short stiff white hairs at the base of the stem, and again upon the small bracts of the inflorescence: radical leaves few, long-peduncled, 2 or 3 inches broad, deeply about 5-parted, the lobes mostly oval or oblong, obtuse and entire; lower cauline more cuneately cleft, and the segments 3-lobed: racemes long, slender and lax: flowers small, deep blue (pink in the frequent albino state), the stoutish slightly curved spur little exceeding the oblong sepals: follicles slightly divergent.

Middle elevations of the Sierra Nevada, California. It is the *D. patens* of my *Flora Franciscana*, and I formerly supposed it to be the plant which Bentham so named; but, having seen the specimens on which *D. patens* was founded, I am certain that that is only *D. decorum*; not even a variety of that species. In the "*D. patens*" of my *Flora* I included a plant which is of a "deeper green, and glandular-pubescent." This I think will prove to be another distinct species of the Sierra Nevada, though I am not yet able to assign characters enough to warrant its publication. Its root is still unknown to me.

RHAMNUS PIRIFOLIA. Tree about 20 feet high, the naked trunk 4 or 5 inches in diameter, clothed with a smooth bark: branches few and spreading: leaves oblong-ovoid, or some

ovoid, often obtuse or nearly truncate both at base and at the mucronate apex, the largest 3 inches long and nearly 2 in breadth, the margins glandular-crenate or subentire, yellowish beneath, bright green and glabrous above, coriaceous and persistent: berries small, scarlet, mostly solitary in the axils of the leaves, 2-seeded: seeds obovoid, with a deep narrowly cuneate-obcordate groove on the back.

Species apparently peculiar to Santa Cruz Island, off the coast of California; referred by me to *R. insularis* in my list of the plants of that island, but erroneously; the shrub of the far southerly islands and shores being very different.

RHAMNUS BETULÆFOLIA. Deciduous shrub, with slender and flexible somewhat pubescent leafy branchlets: leaves ample, thin, not very strongly veiny, of various outline, from oval to elliptical, ovate-lanceolate and obovate-lanceolate, obtuse or acute, finely serrulate, the largest $3\frac{1}{2}$ inches long and 2 in width, the smaller only an inch; the petioles of all about $\frac{1}{2}$ inch: immature fruits in umbellate clusters, the common peduncle exceeding the petiole, and bearing only a few pedicels.

Banks of streams, in the Mogollon Mountains, New Mexico, 1881, Dr. H. H. Rusby; the specimens distributed as *R. Purshiana*, to which the species is related. But it is very remotely isolated from the habitat of *R. Purshiana* and quite distinct from it in several points. Here described from specimens in the herbarium of Prof. Porter.

RHAMNUS ANONÆFOLIA. Deciduous shrub with few and not slender leafy and puberulent branchlets: thin and not strongly veiny leaves very ample, 3 to 5 inches long, many $2\frac{1}{2}$ inches wide above the middle, all of distinctly obovoid outline and more or less cuneate-tapering below the middle, or even from towards the apex, obtuse or retuse, or some even distinctly obcordate, finely serrulate, especially above the middle, the petioles $\frac{1}{2}$ to 1 inch long: the solitary few-

fruited umbel on a peduncle about as long as the petiole; fruit large, 3-seeded.

Known only from the mountains of Placer County, California, where it was collected in 1892, by Mr. A. M. Carpenter It was distributed under the name of *R. Purshiana*, and is related to that species; but the remarkable cuneate cut of the leaves, being very constant, forbids its being referred to that species; which also does not connect with this geographically.

RHAMNUS SMITHII. Deciduous shrub, with short stout glabrous rather densely leafy and fructiferous branchlets: bud-scales obtuse, densely woolly-ciliate: flowers appearing with the undeveloped leaves, and mostly solitary in their axils: mature leaves 1 or 2 inches long, lanceolate, scarcely acute, finely serrulate: flowers 4-merous: berries on very short pedicels, black when ripe, 2-seeded.

Shrub of southwestern Colorado, at Pagosa Springs, B. H. Smith, and near Durango, Miss Eastwood. Mr. Brandegee has also distributed it as "*R. Californica*," to which it bears no resemblance, having for its only near relative the eastern *R. lanceolata*. The specimens from which the diagnosis is drawn are in the herbarium of Prof. T. C. Porter.

ERIOGONUM DENSUM. Near *E. polycladon*, but only 6 or 8 inches high and very diffusely and compactly branched from the base, the root annual: radical leaves ovate or oblong, scarcely $\frac{1}{2}$ inch long, narrowed to a petiole somewhat longer: branches lanate-tomentose, short-jointed and leafless below, the bracts at the nodes triangular-subulate, spreading or recurved at tip; involucres few-flowered, virgately arranged on the more or less dichotomous branches and branchlets; perigonium rose-color, very broadly campanulate above a distinct suprabasal constriction, the segments subequal, the outer obovate-flabelliform, the inner much narrower, spatu-

late-obovate; achene with a stout triangular beak rather longer than the obtusely trigonous body.

Mountains of New Mexico, near Santa Rita del Cobre.

ERIOGONUM SUBALPINUM. Near *E. umbellatum*, the foliage, pubescence and umbels similar, but less woody at base, the branches shorter and quite prostrate; scapiform peduncles stoutish, erect, 8 to 14 inches high, bearing a simple large umbel of 8 to 12 rays; perigonium large, cream-color, tinged with rose in age, the stipe-like base long, its articulation with the pedicel enlarged; inner segments accrescent, eventually distinctly surpassing the outer ones.

This very common Rocky Mountain species is a plant long confused with *E. umbellatum* as a mere albino state of it; and its segregation will never, by the mere herbarium botanist, be seen to be necessary, unless some anatomical characters unrecognized by me shall be found. To no one is it better known than to me, that in this large genus many species normally deep-yellow-flowered, vary to cream-colored albino states. Yet, in the face of this knowledge, and with no other characters than the more herbaceous and depressed mode of growth, coupled with the inequality between the outer and inner segments of the perianth for this species, I confidently express my opinion that it is a species. Even in the rare instances of its growing along with *E. umbellatum*, as it does on the very high and subalpine plains of Wyoming, I should be able to distinguish the two at a glance, even were the flowers of the same color, so different are they in habit.

In geographical distribution, they are interesting subjects of comparison. In middle Colorado, where twenty-six years since I first began to know the two, *E. umbellatum* is plentiful on the high plains and foothills between the altitudes of 6,000 and 8,500 feet, occupying this belt to the complete exclusion of the other; and it is only after having left the range of this, and risen to moister slopes, near the summer snow banks, at altitudes of 9,000 and 10,000 feet, that one

comes to the habitat of *E. subalpinum*. Then again, far to the northwestward of Colorado, in northern Idaho and northwestern Montana, the region of *E. umbellatum* being again left behind, the hills of the cooler and moister country are the abode of a rank and large growth of the same *E. subalpinum*. Or, proceeding from Colorado directly westward, the higher, more snowy elevations of the mountains of Utah and Nevada yield only *E. subalpinum*, the dry foothills the other; while still further westward, to the south of Idaho, namely along the dry western borders of the Great Basin, toward California and Oregon, *E. umbellatum* is abundant, and even variable in several respects; but there is nothing approaching *E. subalpinum* in any of those regions. On the whole, *E. umbellatum* has a range over about three times the territory that *E. subalpinum* has; and yet they seem to meet and grow together only on the bleak subalpine plains of Wyoming, and that without any intermixing even there.

HEDYSARUM OCCIDENTALE. Stem erect, finely striate, glabrous and shining, 1 or 2 feet high: leaves subsessile, the lowest with very long sheathing stipules; leaflets 17 to 21, elliptic or ovoid-elliptic, 6 to 8 lines long, thin, villous-pubescent along the midvein beneath and the margin, ending in a very prominent villous cusp: flowers red: loment of but one or two very large obovoid joints, these 5 or 6 lines long, transversely veined (scarcely reticulated) and sparsely hispidulous with curved white hairs.

Olympic Mountains, Washington, 1890, C. V. Piper. Plant like *H. boreale* when in flower, though with broader leaflets and widely different fruit.

POTENTILLA REFLEXA. *P. glandulosa*, var. *reflexa*, Greene, Fl. Fr., 65. Rather minutely villous-hirsute throughout, and somewhat glandular, the cymose branching very loose and open: small round-obovoid petals very deep yellow, barely equalling the calyx-segments and with them some-

what reflexed: stamens rather few; filaments filiform and very short: nutlets minute, brown, obliquely pyriform, very faintly reticulate with lighter-colored markings.

Common in dry open pine woods of the foothills of the Sierra Nevada, California.

POTENTILLA HANSENI. *P. glandulosa*, var. *Nevadensis*, Greene, l. c. as to descr.; partly also of Wats. More truly hirsute, often 2 or 3 feet high, slender, the inflorescence more naked and fastigiately contracted: petals light yellow, more than equalling the calyx-segments, not reflexed, scarcely even rotately spreading: filaments filiform and elongated.

Plant common in the middle and higher Sierras of California, growing always in moist land bordering on streams or marshes. It may or may not be the real type of Mr. Watson's var. *Nevadensis*, which is, however manifestly an aggregate. Nor can the name be taken up for any species, even by those who insist on the permanency of varietal names; there being already an European *Potentilla* with that specific name.

POTENTILLA LACTEA. *P. glandulosa*, var. *lactea*, Greene, l. c. Delicately and not notably hirsutulous, scarcely glandular, 2 feet high, of more loosely cymose branching than the last: calyx-segments narrow and elongated, lanceolate-acuminate, surpassed by the broadly obovoid very obtuse white petals.

Common at middle elevations in the southern Sierra Nevada, Cal.; also appearing to form at part of the Watsonian *P. glandulosa*, var. *Nevadensis*.

POTENTILLA VALIDA. Near *P. arguta*, similarly stout, simple, erect and striate, with similar foliage and pubescence, but the inflorescence loosely and regularly dichotomous, forming an eventually open and almost flat-topped cyme 6

or 8 inches broad in fruit: petals large, 3 to 5 lines long, rounded, obtuse, clear yellow: achenes very broadly oblique-ovoid, obtuse, distinctly carinate on the back above the middle, the sides marked with numerous rather coarse simple or forked veins.

The type of this very interesting Pacific American species is of stony hills in the vicinity of Victoria, Vancouver Island, where I collected it in 1890. I have until lately considered it only an extremely ample and sparse-flowered state of *P. arguta*. To *P. glandulosa*, long well known to me, it never occurred to me that this kind of plant could possibly be referred. However, I now have reason to think that it is common in British Columbia, Idaho and Washington, and that the specimens have been referred to *P. glandulosa*. Mr. Sandberg's numbers 47 and 175, as I find those numbers represented in the U. S. herbarium, I take to be of the present species. The extremely large yellow petals and open inflorescence are sufficient characters by which to distinguish it from *P. arguta;* perhaps also the nutlets of this last are, as described, smooth and even, without a carinate dorsal midvein, in which case the fruit character of *P. valida* will be excellent.

PRUNUS OREGANA. Evidently allied to *P. subcordata*, but leaves little more than an inch long, subcoriaceous, pubescent on both faces, in outline oval or broadly elliptic, never subcordate, commonly acutish at both ends, serrulate: flowers unknown: fruits in pairs or threes, on pedicels $\frac{1}{2}$ inch long or more, densely tomentose when very young, more thinly so, yet distinctly tomentulose when half-grown.

Known only from specimens collected on the Yanex Indian reservation in southeastern Oregon, by Mrs. Austin, in 1893; and a most remarkable species, as connecting true *Prunus* with *Amygdalus*. But that it is a plum and not an almond is evident.

RIBES LASIANTHUM. Stout, low, widely spreading and intricately branched, the height seldom exceeding 2 feet branches glabrous; infrastipular spines commonly 3, rather slender, straight: rounded leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, short-petioled, pubescent, cleft to the middle into 3 terminal lobes, with 2 to 4 more shallow and less distinct lateral or basal ones, all these 3-lobed at apex, the sinuses closed: flowers 3 or 4, in very short-peduncled racemes, yellow; calyx about 5 lines long, the hirsute tube much dilated above the ovary, thence tapering gradually to the spreading spatulate lobes; petals also spatulate, shorter than the calyx-lobes; young ovaries hairy: fruit unknown.

An almost alpine species, flowering in the latter part of July, near the receding snow-drifts in the mountains of California above Donner Lake, toward Castle Peak. Somewhat related to *R. leptanthum* of the Rocky Mountains, though also akin to *R. quercetorum* of the Californian Coast Range southward.

SOLIDAGO CILIOSA. Stout low decumbent stems only 3 to 8 inches high, from a multicipitous caudex, the whole plant therefore cespitose, very leafy below: lowest leaves narrowly spatulate, serrate-toothed at the obtuse summit, cauline spatulate-linear, entire, all very densely ciliate along the broad but somewhat winged-petiolar lower half, gradually less so toward the apex: heads in a slightly unilaterally disposed but dense thyrsiform cluster, large, conspicuously radiate, the pedicels and the whole rachis of the inflorescence canescently hirsute: bracts of the involucre lanceolate, thin, serrulate-ciliolate: achenes pubescent.

Collected by the writer, on Mt. San Francisco, in northern Arizona, in July, 1889. A member of that almost hopelessly confluent group made up of *S. multiradiata*, *Virgaurea*, *Purshii* and *spathulata*, yet rather better marked, by its remarkably ciliate foliage and clustered or quite cespitose mode of growth, than any of the above named.

PYRROCOMA CONGESTA. Stems rather slender, 2 feet high or more, simple, leafy below, floriferous from below the middle, the smallish heads clustered in the axils of all the reduced cauline leaves: herbage glabrous throughout, except a scanty pubescence about the inflorescence: radical leaves lanceolate, acute at both ends, entire, the blade 3 or 4 inches long, on a slender petiole as long; cauline smaller, tapering to a short winged petiole: involucres campanulate, about $\frac{1}{3}$ inch high; bracts rigid, oblong, 3-nerved, with acute green tips: pappus tawny, of coarse very unequal bristles; only the outer disk-flowers fertile, the achenes of these oblong, appressed-pilose; abortive achenes of ray and inner disk densely silky-pubescent.

Western base of the Coast Mountains near Waldo, Oregon, 1892, Thomas Howell. Related to the middle Californian *P. elata*, but with very different foliage and inflorescence and perfectly distinct.

PYRROCOMA GOSSYPINA. Stoutish decumbent or ascending stems 8 or 10 inches high, densely clothed throughout, as are also the petioles of the radical leaves, with a fine white mass of cottony wool: radical leaves shortly petioled, lanceolate, coriaceous, subentire, or spinulose-serrate; cauline spatulate-lanceolate, entire, pungently acute: heads large, racemosely disposed one in the axil of each cauline leaf and one terminal; involucre broadly hemispherical, $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter, the bracts in only 2 or 3 series, thin, linear-lanceolate, acute, not notably herbaceous-tipped nor at all squarrose: rays numerous: achenes unknown.

At Bear Valley in the San Bernardino Mountains, California, S. B. Parish, distributed for *Aplopappus lanceolatus*. This is the most southerly species of the genus, so far as known; and no other has an actually cottony pubescence except the very different *P. eriopoda* of southern Nevada; and that is the nearest neighbor to the present species, though the two are not near relatives.

CHRYSOTHAMNUS HUMILIS. Depressed shrub, only 6 or 8 inches high, forming broad compact tufts much branched from the base, in no part tomentose, but somewhat cinereously puberulent throughout: leaves erect, 1 inch long or more, linear or narrowly oblanceolate, acute: heads in small clusters at the ends of the short branchlets, subsessile, 4 or 5 lines high: bracts of the involucre about 3 in each vertical rank, the outermost lanceolate, green and foliaceous but short, lanceolate, the others with green midnerve and greenish rather obtuse tips which are delicately somewhat ciliolate: flowers about 5 in each head, cream color, the rather slender corolla 5-toothed: slender style-tips well exserted: achenes nearly linear, angled and pubescent.

Plains of the Truckee River, Nevada Co., Cal., Mr. Sonne. Probably local, and as near *C. Vaseyi* as any other.

CHRYSOTHAMNUS COLLINUS. Shrub with the aspect of *C. Bigelovii*, though not tomentose, only very obscurely cinereous and notably gummy: leafy branchlets slender, flexuous, bearing few fastigiately clustered subsessile heads at summit: leaves very narrowly linear, acute, 1 inch long or more: heads $\frac{1}{2}$ inch high; bracts carinate, 3 or 4 in each vertical rank, the outer lanceolate, acuminate, the inner nearly linear, cuspidately acuminate, the tips of all erect, scarcely herbaceous, the margins arachnoid-ciliate: achenes densely silky.

Plentiful on the slopes of rocky hills about Rock Springs, Wyoming; differing essentially from *C. Bigelovii* in its involucre and achenes.

CHRYSOTHAMNUS LINIFOLIUS. Tufted woody stems erect, slender and flexible, about 3 feet high, fastigiately branching above, the leafy flowering branches white, glabrous and striate: leaves suberect, narrowly lanceolate, very acute, 3-nerved, about 1 inch long, slightly fleshy, glabrous, the margins minutely scabrous-serrulate: heads many, in a

terminal cymose corymb of which the lateral branchlets surpass the terminal: involucre only 3 or 4 lines high, its bracts few but very unequal, not in vertical ranks, the inner thin, obtuse, the middle ones with abruptly acute herbaceous tips, the outer and very short ones herbaceous throughout: corollas deeply cleft; style-tips linear-subulate, only tardily exserted: achenes linear, villous-hirsute.

In moist alkaline soil, plentiful along a streamlet near Rock Springs, Wyoming, 9 August, 1895. A species of most unusual habitat, all the others inhabiting dry plains or stony hills. The tall slender willowy stems are also very unlike those of any other species of the genus. It is very possibly quite local, though certainly abundant in its locality.

ERIGERON TENUISSIMUS. Perennial, very slender, 2 feet high or more, simple below, equally leafy up to the inflorescence, nearly glabrous: leaves filiform, 1 or 2 inches long; flowering branches at summit of the stem almost racemosely disposed, divaricate, or even somewhat deflexed, each having one or two small heads: bracts of the broadly campanulate involucre in 2 or 3 not very unequal series, the outer ones strigose-pubescent: rays 30 or more, purplish or bluish: achenes oblong-linear, compressed, nearly glabrous.

Near Ventura, California, June, 1893, Miss Anita Symmes.[1] Related to *E. foliosus*, but the leaves absolutely filiform, and the character of the branching most peculiar.

ERIGERON BLOCHMANÆ. Perennial, very stout, equably leafy up to the close terminal corymb of large purple-rayed heads: stem strongly striate and, with the spatulate-linear leaves, canescently hispidulous; the main cauline leaves 2 inches long or more, each with a short very leafy branch in its axil: corymb of 12 to 20 rather short-peduncled heads, these more than $\frac{1}{2}$ inch high, little less than $\frac{3}{4}$ inch broad:

[1] Now Mrs. Anson Blake, of Berkeley.

bracts of the involucre subulate-linear, moderately unequal, in about 3 series, their pubescence whiter and more appressed than that of the herbage of the whole plant: rays 50 or 60, of moderate width for the genus: achenes compressed, perfectly glabrous, chestnut-brown.

Along sandy beaches of the northern part of Santa Barbara Co., California, Mrs. Blochman.

CENTROMADIA PERENNIS. Stems tufted from a perennial root, decumbent, 6 or 8 inches high, sparingly hirsute with white hairs, the herbage otherwise glabrous: leaves pectinately pinnatifid, the segments spinescent, many small entire pungently acute ones crowded on short axillary branchlets: outer bracts of involucre subulate-lanceolate, spinescent: chaff of the receptacle exceeding the flowers, mucronate: ray-achenes black, obliquely triquetrous, nearly smooth, not beaked; those of the disk with one or more linear soft paleæ.

Salado, Lower California, 1 June, 1893, Brandegee.

CARDUUS NEVADENSIS. Biennial, rather slender and somewhat freely branched, 2 or 3 feet high, pale with a rather sparse and close arachnoid tomentum: radical leaves a foot long, of narrowly oblanceolate outline, the segments acutely 3-lobed, 3-veined, the veins conspicuous beneath, each ending in a spine: cauline leaves few and small, more profusely and strongly spinescent: expanded heads $1\frac{1}{2}$ inches high and as broad: bracts of the involucre with triangular-lanceolate appressed glandless base, but tapering very gradually into a long ascending or spreading spinose tip: flowers white; lobes of the corolla much shorter than the throat: anther tips triangular, somewhat cuspidately acute.

Along the bases of cliffs in the West Humboldt Mountains, Nevada, July, 1895.

AGOSERIS DASYCARPA. Pale green and glaucescent, also sparsely white-tomentulose throughout, except the involucre:

scapes stoutish, about a foot high, twice the height of the remotely and deeply pinnatifid leaves, both the rachis and segments of which are broadly linear, the latter either divaricately spreading or falcately incurved: bracts of the involucre imbricated in 3 or 4 series, the outer broadly, the inner more narrowly triangular-lanceolate, villous-ciliolate, also with some villous pubescence on the back: ligules large, yellow, only 2 or 3 outer circles of them fertile; achenes of these pubescent, very slenderly fusiform, ½ inch long including the rostrate-attenuate vacant upper portion; pappus sessile, its soft white bristles rather longer than the achene: abortive achenes of the central portion of the head glabrous.

Species of the elevated cold desert region of northeastern California and adjacent Oregon and Nevada; in aspect approaching the very different *A. retrorsa*, but in character of fruit more allied to those Rocky Mountain species, of which *A. glauca* is the type.

CREPIS PLATYPHYLLA. Related to *C. runcinata*, similarly acaulescent, the corymbosely panicled stout scape 12 to 18 inches high, rather strongly hispid and somewhat glandular: leaves depressed or ascending, oval and oblong to spatulate-oblong, subsessile or short-petiolate, mostly 4 to 6 inches long, often 3 in breadth, obtuse, coarsely and remotely, often somewhat runcinately toothed, green and glabrous above: involucre 4 or 5 lines high, very hispid, slightly glandular: achenes dark brown, oblong-fusiform, slightly contracted toward the summit, sharply 10-ribbed.

Moist mountain meadows of southern Idaho and northern Utah, about Bear Lake, etc. Type specimens of my own collecting near Montpelier, July, 1889.

PHLOX ALYSSIFOLIA. Stems nearly prostrate, herbaceous, short, stout, from a subligneous branching caudex, the short internodes hispidulous with white hairs: leaves about ¾ inch long, oblong-linear, cuspidately acute, plane, rather

thick, with callous white entire margins, and a similar mid-vein very prominent beneath, though obsolete above, both faces glabrous, only the margins loosely ciliate toward the base of the leaf: flowers very few, large, pale purple or white, short-pedicelled at the ends of the branches: calyx-tube glandular-pubescent, the scarious line below the sinuses very narrow; teeth oblong-lanceolate, aristate-pointed: corolla-tube well exserted; segments narrow, obtuse, entire: style about equaling the tube of the corolla.

Hillsides about Twelve-mile Lake, Wood Mountain, Assiniboia, 7 June, 1895, Mr. John Macoun.

# A New Genus of Polemoniaceæ.

An attentive study of that small assemblage of south-western desert annuals referred by some to *Gilia*, by some to *Læselia*, and by others to *Navarretia*, has brought to light characters sufficient to establish them in generic rank; a view of their relations which the peculiar vegetative characters and general appearance strongly enough suggest. I find that hitherto not even their leaves have been correctly described. That which is merely the terminal odd segment of a regularly pinnate leaf has been treated as the whole leaf, while the real pinnæ, consisting as they do of several opposite pairs of long white bristles, or tufts of bristles, have been ignored, at least as to their true morphological character.

As I indicated long ago,[1] the calyx in the Polemoniaceæ is the floral organ which affords the best characters for the definition of genera; but here, as in other natural genera of the family, the most striking and perfectly constant peculiarities of this organ seems wholly to have escaped the eye of Asa Gray and others. And in no two genera within the limits of one and the same natural order are the calyxes more unlike than in these desert annuals and the genus *Navarretia* to which they have often been referred.

The plants make a nearer approach to *Læselia* than to any other genus; but Gray, after having at one time pronounced two of them to be only annual-rooted species of that genus,[2] afterwards retracted, and placed all three in a much more unnatural station, as a section Chætogilia of the genus *Gilia*. But the *Gilia* of the *Synoptical Flora*, as I remarked long ago, would not have been much worse, as a pretended genus, if the author had put into it the entire family of the Polemoniaceæ.

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[1] Pittonia, i. 121.

[2] Bot. Calif. State Survey, ii. 466.

The present group I take pleasure in dedicating to a most laborious and deserving botanist, the Reverend Father A. B. Langlois of St. Martinsville, Louisiana.

## LANGLOISIA.

Rigid diffusely branched and low annuals. Leaves pinnately divided, but only the terminal segment of herbaceous and leaf-like development, this mostly cuneiform, or linear, with dilated and 3-toothed tip; pinnæ in several pairs but mostly reduced to a long white bristle or tuft of bristles. Flowers few or solitary in the axils of the leaves, not bracted. Calyx-lobes equal, spinescent-tipped; the tube with scarious spaces between the angles and eventually splitting to the base, as into 5 distinct sepals, the disrupted members then almost rotate-spreading. Corolla usually bilabiate and stamens declined-incurved. Capsule strongly and even almost sharply triquetrous, many-seeded. Seeds mucilaginous when wetted.

** Corollas bilabiate; stamens declined.*

1. L. MATTHEWSII. *Lœselia Matthewsii*, Gray, Bot. Calif. ii., 466. *Navarretia Matthewsii*, Coville, Death Val. Exp., 153.—Southeastern California, in the Mohave Desert and for some distance northeastward.

2. L. SCHOTTII. *Navarretia Schottii*, Torr. Bot. Mex. Bound, 145; Coville, l. c., 154. *Gilia Schottii*, Wats. King Exp., 267. *Lœselia Schottii*, Gray, Bot. Calif. l. c.—Southern Utah to Sonora and extreme southeastern California.

** * Corolla regular; stamens not declined.*

3. L. SETOSISSIMA. *Navarretia setosissima*, Torr. and Gray, Bot. Ives Rep., 22. *Gilia setosissima*, Gray, Proc. Am. Acad., 271, partly; Syn. Fl. Suppl., 409, where his former strange confusing of this and the two other species in one is corrected.—Southern Utah and Nevada, and adjacent districts of Arizona and E. California.

## Some Mexican Eupatoriaceæ

Eupatorium kœlliæfolium. Stout, erect, 2 feet high or more, obscurely and sparsely puberulent throughout: stem terete, finely striate, its leaves all alternate, even the lowest, but the axil of each bearing a sterile branch the leaves of which are mainly opposite: leaves about 1 inch long (those of the branchlets smaller), lanceolate, entire, scarcely acute: heads in a rather compact terminal corymb: bracts of the involucre in about 2 series, the outer triangular-lanceolate, the inner oblong-lanceolate: both corolla and pappus flesh-color: achenes black, hispidulous along the sharp ribs.

Pine plains along the base of the Sierra Madre, Chihuahua, 12 Sept., 1887, C. G. Pringle, 1887 (n. 1262).

Eupatorium euonymifolium. Rather slender, opposite-leaved, branched from the base, 12 to 18 inches high, stem puberulent, foliage almost glabrous: leaves sessile, ovate or oblong-ovate, 1 inch long, obscurely crenate or subentire: rather loose cymes of few heads at the ends of all the branches: bracts of the involucre thin, subequal, lanceolate, distinctly nerved only at base and to the middle: flowers and pappus white: achenes black, sparsely hispidulous, not prominently ribbed.

Rocky slopes of the Sierra Madre, Chihuahua, 24 Sept., 1887, C. G. Pringle (n. 1264).

Stevia deltoidea. Stems stout, ascending, 2 feet high, from a fascicle of coarse fleshy-fibrous roots: lower half of the stem simple, leafy, densely woolly-hirsute, the upper comparatively leafless, devoid of obvious pubescence, and rather compactly corymbose: leaves ovate-deltoid, the lowest an inch long or more, abruptly and cuneately tapering to

the short petiole from the broad and otherwise truncate base, the margin coarsely crenate: bracts of the involucre oblong-linear, obtuse: flowers red-purple: pappus of 3 aristiform barbellate awns and as many broad short paleæ.

Sierra San Felipe, Oaxaca, 6 Oct., 1894, Pringle (n. 4976).

STEVIA DECUMBENS. *S. elatior*, var. ? *decumbens*, R. & G. Am. Journ. Sci., 3 ser., l. 152. Stems solitary, weak and assurgent, leafy only toward the base, naked and rather loosely somewhat trichotomous-cymose at summit: leaves somewhat deltoid-ovate, obtuse, crenate, tomentose beneath, but loosely so, the stem and branches nearly glabrous: lower branches of the ample and open inflorescence almost divaricate: flowers large, purple, pubescent externally: bracts of the involucre very acute, or acuminate.

Near Oaxaca, 1894, C. G. Pringle (n. 4974). A plant by no means nearly allied to *S. elatior*; in mode of growth, and general appearance, about as far removed from it as possible, within the limits of the genus. *S. elatior* is erect, leafy and freely branching throughout; the present species agreeing with it in almost no particular, excepting characters of pappus and achene.

Vol. III. Part 14.

# PITTONIA.

## A Series of Botanical Papers

BY

EDWARD L. GREENE,

*Professor of Botany in the Catholic University of America.*

WASHINGTON, D. C.

JUNE, 1896.

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# Critical Notes on Certain Violets.

With that which for a hundred years and more has been received as typical *Viola pedata*, that is, the plant with all five petals of one color, I was for many years familiar; but until this season I had never seen that much more beautiful pansy-like thing which passes for *V. pedata*, var. *bicolor*. In the vicinity of Washington the plant last named is plentiful. It has from the first seemed to me to differ from the northern plant with pale blue flowers in other respects besides the color of the petals; and, in looking up its history as a supposed variety of *V. pedata*, it has become clear beyond the possibility of any doubt that this pansy-flowered violet of Maryland and Virginia is the very type of Linnæus' *Viola pedata*. While this plant was known and much admired in European gardens in Linnæus' lifetime, there is no evidence that the more plain and less attractive plant, now long mistaken for the true *V. pedata*, appeared even in England any earlier than the year 1789, at which time it was figured in the *Botanical Magazine*. The editor of the journal unwisely cited, in connection with his new figure, all the Linnæan synonymy and descriptions; and it does not appear that since 1789 any one has questioned that all which Curtis gives is correct. On the contrary, from that date forward the plant of the pale blue flowers there figured has been freely assumed to be the real *V. pedata*, while the true thing has been variously estimated as a new variety of it, or as a distinct species. Pursh, it is said by Rafinesque, called it *V. pedata*, var. *bicolor*. Rafinesque himself gave it, as a proposed new species, the name *V. atropurpurea*, and Loddiges

figured it as a new species under the name of *V. flabellifolia.* Yet any and all these blunderers, learned or unlearned, need only have referred to a certain folio published only fourteen years anterior to Curtis' figure, to have gained the knowledge that the plant of Linnæus had been the selfsame which they were regarding as something new; and that the really new thing was that which they were erroneously supposing to be the Linnæan *V. pedata.* Linnæus was still living when Hill published in his *Vegetable System* a figure of *V. pedata* which unmistakably indicates that the upper petals are dark-colored, the others not so.

But let us go back to the original data. Of course we cannot determine from Linnæus' description alone what sort of plant he had in mind when he named it *V. pedata.* His diagnosis of—or rather, his phrase-name for—the species is only this: *Viola acaulis, foliis pedatis, septempartitis*;[1] and any kind of an acaulescent pedate-leaved violet—and many such are known—would answer that description. We only know what it was which he meant by *V. pedata* by the synonymy which he appends; and that refers us to certain earlier descriptions, and a figure by Plukenet. The first of the synonyms given by the Swedish author is "*Viola foliis palmatis,* Gron. Virg. 107." The second is "*Viola Virginiana tricolor, foliis multifidis, cauliculo aphyllo,* Pluk. Alm. 388. t. 114: f. 7." Of these two synonyms, that of Gronovius taken merely alone, and as cited, would not help us; but, turning to the page of that author, we find that he also made good the deficiency of his own phrase-name by quoting as a synonym a much older and better one, the first ever given, I believe, and by Banister, the pioneer of Virginian botany, whose phrase is this: "*Viola tricolor, caule nudo, foliis tenuius dissectis.*"[2]

So, then, every synonym which Linnæus either directly or by implication gives, brings us to the pansy-like three-colored violet of our southerly districts, as being precisely what

[1] Sp. Pl. i. 933.

[2] Banister, in Ray, Hist. Pl. ii. 1928 (1688).

he had in view for *V. pedata*. Plukenet's figure cited is poor, so poor that he afterwards published a second, and this an excellent one,[1] which Linnæus may not have seen; but even the earlier poor figure, as well as the good one, distinctly indicates the uppermost petals as dark-colored.

I shall now present an outline, in chronological order, of the earlier bibliography of the species, excluding the pale concolorous northern plant which, as I have said, had not appeared in Europe in Linnæus' time.

*Viola tricolor, caule nudo, foliis tenuius dissectis*, Banist., in Ray, Hist. ii. 1928 (1688).
—— *Virginiana tricolor, foliis multifidis, cauliculo aphyllo*, Pluk. Alm. 388, t. 114, f. 7 (1696).
—— *foliis palmatis*, Gron. Virg. 107 (1739).
—— *inodora flore purpurascente specioso, foliis admodum digitorum incisis*, Clayt. in Gron. l. c. (1739).
—— PEDATA, Linn. Sp. Pl. ii. 933 (1753).
—— *multifida*, Mill. Dict. 8 ed. (1768).
—— *pedata*, Hill, Veg. Syst. xxii. t. 58, f. 2 (1775).
—— —— var. *atropurpurea*, Ging. in DC. Prodr. i. 291 (1824): Fl. des Serres, xiii. 131, t. 1361.

In view of the fact that all three of the published figures which it is possible for Linnæus to have seen represent his *V. pedata* with a pair of dark-colored petals, and, since all the names and descriptions which he cites indicate a Virginian plant with tricolorous pansy-like showy flowers, it is beyond question that several of the later generations of botanists have been wrong in their assumption that the northern plant is the plant of Linnæus. To that, therefore, I assign a new name, as a variety.

V. PEDATA, var. INORNATA. *V. pedata*, Curtis, Bot. Mag. t. 89, excluding all the synonymy; also of all more recent authors, but not of Linnæus.

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[1] Plukenet, t. 234, fig. 3.

Among Californian violets there is one which, though for some time past accepted as a variety of *V. lobata*, I have always thought of as a species, and now find to have been accorded specific rank by Dr. Kellogg.

V. Brooksii, Kell., Calif. Hortic. ix. 281 (1879), and Bull. Calif. Acad. i. 132. *V. lobata*, var. *integrifolia*, Wats. Bot. Calif. i. 57. The outline of the foliage here is extremely different from that of *V. lobata*, and, since there are no intergradations between the two, it is not remarkable that the identity of Dr. Kellogg's plant and that of Mr. Watson should not have been suspected. The plant most resembling *V. Brooksii* is the Atlantic *V. hastata*.

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That very natural group of West American species at the head of which *V. Nuttallii* should stand, has long been in need of a careful revision. They are difficult, no doubt; but I think that even an herbarium botanist, willing to give to the dry materials due examination and comparison, might have done better by these species than was done by author of the *Synoptical Flora*. But since the violets of that work have been published, and that author's decisions will have a certain authority with many, it is necessary that one should at the outset call attention to certain of his pronouncements that happen to be erroneous. Under the heading which includes *V. pedunculata* and *V. Nuttallii* it is written: "ovary and oval capsule glabrous;"[1] but the ovary and capsule in *V. Nuttallii* appear to be invariably pubescent. For the rest, I must say that it never occurred to me that those two species could be thought of as belonging to the same natural group. *V. pedunculata*, in all save the color of its petals, is far more like *V. canina*. It is always distinctly caulescent, while *V. Nuttallii* is never very obviously so. This brings us to the criticism of another head-

[1] Syn. Fl. i. 199.

ing, higher up on the same page already quoted, a general descriptive line made to cover all the species from *V. pedunculata* to *V. trinervata*. The line is this: "Subacaulescent, first flowering from the ground, and later usually more caulescent."[1] Of none of the species is this true; and the error arises out of the author's having mixed, in the herbarium, species wholly distinct in nature. The most truly caulescent species are obviously caulescent, even from the earliest flowering stage; while in the others the caulescent character is as much obscured in the mature specimens of the later season as it is in the earlier stage; for in the late ones the leaves are longer and larger in full proportion to the increased length of stem, thus concealing the caulescent growth quite as effectually as it is concealed at the first. But here I may state the actual difference between the group to which *V. Nuttallii* and *præmorsa* belong, and that one which contains *V. aurea* and *purpurea*. The species of the former, like many eastern stemless violets, have the habit of displaying a luxuriant leaf-growth just after the flowering time; while the members of the other group do no such thing; their leafy stems being just as obvious at first glance when the plant is past flowering and in maturity as they were at the earlier stage.

The truth is, then, that the northern plants, *V. Nuttallii*, etc., are constantly subacaulescent, whether young or old, and that the California species, needlessly confused with these in the work referred to, are like *V. pedunculata* distinctly caulescent, even when young; and I must say that it would have been better systematizing—less fallacious, rather—to have merged *V. Nuttallii* and *præmorsa* in one, than to have merged *V. purpurea*, *aurea* and *pinetorum* in either; two of these last being manifestly caulescent, while in the case of the others it takes sometimes a second look to determine, even in well-matured specimens, that they are

[1] Syn. Fl. i. 199.

not acaulescent. And the justice of this criticism will further appear to any one who will take the trouble of noticing that *V. Nuttallii* and *præmorsa* both have their leaves entire, or nearly so, while the others, those of the South that have been confounded with them, exhibit always a distinctly and often coarsely toothed foliage.

Of the whole group, I recognize the following species:

V. NUTTALLII, Pursh, Fl. i. 174. This is usually small and depressed, the small yellow flowers borne on peduncles shorter than the long narrow leaves; herbage appearing glabrous, but a good lens revealing finely but densely and somewhat retrosely ciliate leaf-margins. When growing in stony or gravelly ground the root is more deeply seated, so that the specimens when gathered show a considerable length of proper stem from undergound. In better soil, and in shady places, the caulescent character becomes more manifest in the living plant. From such a specimen the very fair figure given in Hooker's Flora must have been drawn.

The species belongs strictly to the Rocky Mountain region, no doubt. It is plentiful on the plains of western Kansas, thence westward and northward to Utah, Arizona, and the British border; hardly, however, to "British Columbia," where either *V. præmorsa* or some related species holds the field in its stead. Mr. Watson's variety *venosa*, of the mountains of Nevada, I have not seen; but I suspect it may be the same as *V. aurea*, Kell.

V. ATRIPLICIFOLIA. Smaller than the preceding, the whole stem including the long petioles and still longer peduncles only about 2 inches long; herbage cinereously puberulent, the leaf-margins in no degree ciliate; petioles 1 to $1\frac{1}{2}$ inches long, the lamina mostly less than $\frac{1}{2}$ inch, that of the lowest leaf broader than long, all truncate at base and angularly but not deeply 5 to 7-lobed, or the uppermost 3-lobed and

hastate: peduncles well surpassing the leaves: flowers small, yellow, the upper pair of petals red-purple externally.

National Park, Wyoming, on dry hills; collected in 1893 by Mr. Burglehaus, and distributed as *V. aurea*, var. *venosa;* the small leaves very like those of some small *Atriplex* or *Chenopodium;* the pubescence as characteristic as are the long thickened or flattened petioles. Of this excellent species I have seen no specimens but those contributed to the herbarium of the Catholic University by Father Langlois.

V. LINGUÆFOLIA, Nutt., in T. and G. Fl. i. 141. In an ample sheet of specimens of "*V. Nuttallii*," given me by Mr. Kelsey, collected by himself at or very near the original locality of *V. linguæfolia*, two good flowering specimens present so strong a contrast with the others (which are all the real *Nuttallii*) that I promptly transferred them to my *præmorsa* cover, though without examination; not, however, as thinking them to be very good *præmorsa;* and they come from a good distance east of the proper range of that species, really inhabiting the Rocky Mountain Region, while *præmorsa* belongs to the Pacific slope proper, where the climate is very different from that of the Camass Prairie. The pubescence is of a different character from that of *Nuttallii;* the leaves do not taper to the petiole; the proper stem is shorter, and the twice or thrice larger flowers are borne well above the leaves. At the same time, while thus approaching *præmorsa* in character, that species is still very different. I doubt not that *V. linguæfolia* will both prove itself a good species, and also take in a considerable part of what, since the recent reinstatement of the long-suppressed *V. præmorsa*, has been referred to that species.

V. PRÆMORSA, Dougl. Bot. Reg. t. 1254. For this beautiful species there exists perhaps no herbarium type. It was described and figured from a plant growing and blooming in the garden of the London Horticultural society; the name

being taken up out of the society's herbarium, where dried specimens from Oregon were preserved. By its distinctly hirsute pubescence, elongated peduncles far surpassing the leaves, and very large narrow-petaled corollas, it is most clearly distinct from *V. Nuttallii;* while the intermediate *V. linguæfolia* is recognizable as separate from it by its smaller broad-petaled corollas, and shorter and denser pubescence.

The name *V. præmorsa* is inappropriate; for, whatever the young plants grown in England from seed may have shown, none of the native Oregonian specimens to which we refer here exhibit any other than an elongated branching root. It is also to be remarked that the figure, which is the only publication type for *V. præmorsa*, gives no indication of any purple coloring on the outside of the petals, and that the dried specimens for the most part exhibit the corollas as clear yellow; though a few from Plumas Co., California, collected by Mrs. Austin, have the uppermost pair of petals entirely of a rich brownish purple on the outside. But in this form the petals are broader than in the type, and the plant may be a hybrid between *præmorsa* and *purpurea*, possibly.

V. AUREA, Kell., Proc. Cal. Acad. ii. 185, f. 54 (1863). This is readily distinguishable from *V. præmorsa* by its caulescent character, the manifest leafy stem being stoutish and upright, and by its very different leaves, these all distinctly and coarsely dentate, and varying in outline from round-ovoid in the lowest, to deltoid-ovate and triangular-lanceolate in the uppermost. In the *Flora Franciscana* I erred in confounding this with *V. purpurea;* but in this I allowed myself to be misled by Dr. Kellogg himself. My own set of the earlier volumes of *California Academy Proceedings* is not only of the original issue, it is the set which was Dr. Kellogg's own, it having been purchased by me from Mr. Harford, after Dr. Kellogg's decease. The volumes abound in manuscript notes of the Doctor upon some of his species. Under the

figure of his *V. aurea* he had written: "Mt. Diablo. Wrongly considered a var. of *Nuttallii*. A distinct sp." Now the plant of Mt. Diablo is certainly not this, but *V. purpurea*; and I, at the time of preparing the manuscript of the violets for my *Flora*, knowing nothing of the Nevadan type of *V. aurea*, easily believed that it might be, what the Doctor's note seemed to imply, specifically identical with *purpurea*. I now have grounds for expressing another opinion. Specimens are now in my herbarium from the eastern slope of the Sierra—that is, from the *V. aurea* region—collected in Plumas Co., Calif., by Mrs. Austin in 1876, which answer perfectly to the account of *V. aurea;* and what is more, Mrs. Austin was taught by Mr. Watson to distribute these as "*V. pedunculata*" (!), to which species they bear as little resemblance, however, as to *V. præmorsa;* though they have the pubescence of the latter, combined with the obviously caulescent growth of *V. pedunculata*, while the leaves and flowers are those of neither.

V. PURPUREA, Kell., l. c. i. 56 (1855); Greene, Fl. Fr. 243, excl. var. I have little to add to the account which I gave of this type, in the *Flora Franciscana*. It is in middle and southerly sections of California a plant of the higher parts of the Coast ranges of mountains; hardly in the Sierra Nevada, where *V. pinetorum* takes its place. But far northward, it crosses the line of the Sierra, and appears on the high plains of Modoc Co. But the most beautiful specimens seen are some obtained by Mr. Howell in the Coast mountains of southern Oregon, near Waldo. In these the leaves are relatively broader than in the middle Californian type, many of the lower being broader than long, and of an outline that may be defined as almost semiorbicular. The flowers, also, in this northern state of the species are larger than in the type; but this Oregonian plant, as it nears the habitat of *V. præmorsa* makes not the least approach to that species in character or aspect, but rather departs the farther from it.

Our natural aversion to the name *purpurea* for a yellow violet diminishes somewhat under consideration of the fact that it was the purple of the herbage of this plant which suggested the specific name.

V. PINETORUM, Greene, Pitt. ii. 14 (1889). *V. purpurea*, var. *pinetorum*, Greene, Fl. Fr. 243 (1891). It will be seen by referring to the original diagnosis of this plant, that it was at first mistaken for a blue-flowered species. The first good flowers which I saw of it came in from Mr. Parish, who gets a form of it not far removed from the type, in Bear Valley, of the San Bernardino Mountains; and the corolla is certainly yellow, only fading purplish or bluish. On perceiving that it was truly yellow-flowered, I quite too hastily referred it, as a variety, to *V. aurea*. While perfectly distinct from that, it is, on the other hand, of that accrescent-leaved, short-stemmed group to which *V. præmorsa* and *Nuttallii* belong. In mature specimens the long narrow foliage quite surpasses all the stem and peduncles. Yet no one would refer it to either of the species last named. Its denser pubescence, its prominently toothed long and narrow foliage, and its hoariness with fine pubescence, are three excellent characters by which to distinguish it from *V. Nuttallii*, not to speak of the excessively long roots.

Its range appears to be up and down the Sierra from back of San Bernardino northward to Yosemite and Donner Lake; though at these northern stations it obtains a width of foliage, and a more caulescent habit which amount to an intergrading with *V. aurea;* but the type, of the high and dry pine woods west of the Mohave Desert, can not but be taken as representing an undoubted species.

## Studies in the Compositæ.—III.

The several homochromous asteraceous plants which I shall next take into consideration are among those left unmentioned in the course of my discussion of the *Aplopappus-Bigelovia* series of Asa Gray.[1] The first of them is a Mexican plant of somewhat recent discovery, namely,

Chrysopsis nivea. *Aplopappus niveus*, S. Wats., Proc. Am. Acad. xxiii. 227 (1888).—Of gravelly banks or borders of streams in the mountains of northern Mexico; every way a *Chrysopsis*, and of the *Ammodia* section of the genus notwithstanding its having ray flowers; but the pubescence is rather that of certain southeastern species of typical *Chrysopsis*. The monocephalous and pedunculiform branches are peculiar for this genus, though in the Floridian *C. oligantha* there is a near approach to this condition.

Dr. Watson's insecure command of right terms in descriptive botany betrayed him into the mistake of beginning his account of this species by the mention of a "caudex." The plant has no such organ. The slender stems arise from an apparently rather deeply seated root, quite as in the related *C. rudis* of Californian stream banks.

Hazardia Whitneyi. *Aplopappus Whitneyi*, Gray, Proc. Am. Acad. vii. 353 (1868).—This is the Sierra Nevada representative of the Coast Range and seaboard genus *Hazardia*—a genus of most excellently marked habit, and one

[1] The reference here is to certain papers under the title of *Observations on the Compositæ*, published in the second and third volumes of Erythea, 1894, 1895.

which, if I mistake not, has its largest development along the Andes of South America, particularly in Chili, where very many species have been published by Dr. Philippi, under *Pyrrocoma*.

---

Some four other species of the homochromous group above referred to, gathered in from the rather widely scattered positions which they hold in Gray's arrangement of the species, are so much at agreement in certain important characters that I trust they may, in the eyes of some other synantherologists appear, as they do clearly appear to me, to form a natural genus.

One of these is a decidedly rare plant, now for some time received under *Aplopappus*, the *Stenotus multicaulis* of Nuttall. In my own revision of the *Stenotus* series, I was unable to include it in that genus because of its rigid scanty brownish pappus, its peculiar involucre and habit. And Nuttall himself, the discoverer of the plant, appears to have hesitated between referring it to *Stenotus*, or taking it as the type of a distinct genus.

Very near to this is the *Bigelovia Engelmanni* of Gray; for, though its heads are rayless, the involucre, the corolla, style-tips, pappus, and even the entire leaves are those of the genus here to be proposed, and not those of any genuine "*Bigelovia*" according to Gray, that author himself having been obliged by these characters to place it in a subsection apart from all the other members of his genus. Had it only possessed ray-flowers, he must undoubtedly have placed it in *Aplopappus*, and near his *A. multicaulis*.

Next of kin to the species last mentioned has been published as a variety *Wardi* of Gray's *Aloppappus Fremonti*; but this is a very distinct species even in habit, as well as character, and serves to connect with this generic group the larger, coarser plant which has borne the names *Aplopappus Fremonti* and *Pyrrocoma foliosa*.

From these four *Prionopsis ciliata* is distinguished as a generic type by no more striking characters than an annual root, serrated foliage, and a coarser pappus; and this again might be joined to another monotypic genus, *Xanthisma*, but for the still coarser, even paleaceous-aristate pappus of the latter.

Having been for a long time in a state of hesitancy between uniting the six species under the oldest name, *Xanthisma*, and receiving them as of three genera, two of which are monotypic, I now choose, not without some reluctance, the latter alternative, taking for the name of the new genus that which Nuttall offered as subgeneric under *Stenotus*, namely,

## OONOPSIS.

Plants with equably leafy upright stems, usually tufted, upon a ligneous caudex or crown. Leaves entire; herbage glabrous (except in the typical species). Heads in a terminal fastigiate cyme; radiate (except in the second species). Involucres ovate or broader; bracts of the same not carinate, but flat and often 3-nerved, imbricated, subcoriaceous and with green-herbaceous tips ending in a cusp. Disk-corollas subcylindric, with 5 rather short teeth. Stamens and styles scarcely exserted; tips of the latter from ovate to subulate, shorter than the stigmatic part. Achenes mostly glabrous, and pappus coarse, rigid and rather scanty.

1. O. MULTICAULIS. *Stenotus multicaulis*, Nutt., Trans. Am. Phil. Soc. vii. 335 (1840). *Aplopappus multicaulis*, Gray, Am. Nat. viii. 212 (1874). *Aster multicaulis*, O. Ktze., Rev. Gen. i. 318 (1891).—A somewhat local mountain undershrub of northwestern Wyoming; seldom collected and not yet known in good fruiting condition.

2. O. ENGELMANNI. *Bigelovia Engelmanni*, Gray, Proc. Am. Acad. xi. 75 (1876). *Aster Angelandri*, O. Ktze., l. c. 315.—Local on the plains near Hugo, Colorado.

3. O. WARDI. *Aplopappus Fremonti*, var. *Wardi*, Gray, Syn. Fl. i. part 2. 128 (1884).—Plant apparently as rare as either of the two foregoing; obtained only by Mr. L. F. Ward somewhere in Wyoming; certainly wholly distinct from the next.

4. O. FOLIOSA. *Pyrrocoma foliosa*, Gray, Journ. Bost. Soc. (1843) 5. *Aplopappus Fremonti*, Gray, Proc. Philad. Acad. (1863) 65.—Plentiful on clayey plains along the upper Arkansas in Colorado, yet not known from any point besides.

Although when enumerating in ERYTHEA (vol. ii. p. 70) the species of *Pyrrocoma* I allowed this plant a place in that enumeration, I did it with the reluctance which is there intimated, and should not have named it in that connection had it not been early published under that genus.

---

At the time when the limits of the genus *Stenotus* were under investigation, I could not but recognize an exceedingly intimate relation as subsisting between typical *Stenotus* and *Xylorrhiza*. The two types are exactly similar, and equally unlike anything that should be called *Aster*, in vegetative characters, the tufted low leafy evergreen stems of both springing from a branching thick woody caudex. And the similarity as to inflorescence, floral structure, and peculiarities of the fruit is almost as complete. The pappus is clear white in *Stenotus*, while in *Xylorrhiza* it is fulvous or darker. Here also the involucral bracts are, in general, narrower and more acuminate. For the rest, the color of the flowers constitutes the main distinction; *Stenotus* being xanthic, *Xylorrhiza* cyanic; and perhaps but for that prejudice in favor of these mere colors as furnishing data for generic distinctions in this tribe of plants—a prejudice which is the result of long deference to high authority—I should have united these two groups, white-flowered and yellow-flowered respectively, under the name which has precedence of pub-

lication, that is, *Xylorrhiza*. But I could not, at this juncture, leave out of consideration another set of suffrutescent asteraceous plants in habit different from both *Stenotus* and *Xylorrhiza*, which are also almost as foreign as either to true *Aster*, but which may in some way more easily conjoin themselves to *Xylorrhiza* than to *Stenotus*. It was largely in reference to these few half-shrubby, but more freely branching, cyanic plants of southwestern deserts that I long since determined to present as distinct genera *Stenotus* and *Xylorrhiza*. I here present the species, as far as they are known to me, under the two groups.

XYLORRHIZA proper (Nutt. Trans. Am. Phil. Soc. vii. 297, 1840). *Stems low, with erect leafy monocephalous branches; leaves entire.*

1. X. GLABRIUSCULA, Nutt. l. c. *Aster glabriusculus*, Torr, & Gray, Fl. ii. 159 (1841).—Western Wyoming, in clayey soils or among rocks.

2. X. VILLOSA, Nutt. l. c. *Aster Xylorrhiza*, Torr. & Gray, l. c. 158.—Habitat of the preceding, and very distinct from it, though less common.

3. X. PARRYI. *Aster Parryi*, Gray, Am. Nat. viii. 212 (1874). *A. venustus*, Jones, Zoe, ii. 247 (1891).—Southwestern Wyoming and adjacent Utah. Plant differing from the two preceding in general aspect, being more leafy below, with fewer and larger long-peduncled heads, thus connecting with the succeeding.

Subgenus MEGALASTRUM. *Larger, more freely branching; leaves more or less toothed or serrate.*

4. X. WRIGHTII. *Aster? Wrightii*, Gray, Pl. Wright. ii. 75 (1853). *Townsendia Wrightii*, Gray, Bot. Mex. Bound. 78 (1859).—On the lower Rio Grande, Texas.

5. X. TORTIFOLIA. *Aplopappus tortifolius*, Torr. & Gray, Jour. Bost. Soc. v. 109 (1845). *Aster tortifolius*, Gray, Proc. Am. Acad. vii. 353 (1868). *A. Mohavensis*, Coville, Death Valley Exp. 126 (1893).—Along the Colorado River in Utah and Arizona, westward to middle California in the vicinity of the Mohave Desert.

6. X. FRUTESCENS. *Aster frutescens*, S. Wats., Proc. Am. Acad. xxiv. 55 (1889).—Northern Lower California; strictly congeneric with the last, though with heads much smaller, and foliage reticulate-venulose.

7. X. ORCUTTII. *Aster Orcuttii*, Rose, Bot. Gaz. xvi. 113, t. 11 (1891).—Of the Colorado Desert, in the southern part of California; in aspect too unlike any of the preceding, and more conformed to that of certain species of *Hazardia* by its leafiness and short-peduncled heads; but in characters of flower and fruit it is a *Xylorrhiza*. Mr. Rose has shown himself a careful observer by noticing the white bark of all the stems and branches. It, however, characterizes every species of this genus, though I believe no one in describing any of the others made any mention of it. It should enter into the description of the genus as a marked vegetative character.

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It sometimes happens that a botanist's first impression of the affinities of some new plant are nearer the truth than the different conclusions which he may have reached under the guidance of the conventional criteria of affinity; a method largely empirical, and its results often unsatisfactory. The case of the plant which Asa Gray, after he had given it analytic study, named *Aster eryngiifolius*, I take to be illustrative of this; for, in my view, his earlier judgment that it was a species of *Prionopsis*, though not quite correct, was more philosophical, and came nearer the truth.

In its whole aspect this plant is most unlike anything

which, up to the time of its discovery, had ever been disposed under the genus *Aster*. In habit, and also in its essential characters, if you make little or no account of the color of flowers, the species is indeed much more like *Prionopsis*, to which this author at the first referred it, than like *Aster*, where he at length concluded to place it.

There is, however, another yellow-flowered genus to which, according to my criteria of affinities, this plant and its allies are more nearly related than to either *Aster* or *Prionopsis*, and that is *Pyrrocoma*. But the *Pyrrocoma* species are yellow-flowered and have fusiform roots, while the plants here under consideration have tuberiform roots or rootstocks, and rays either white or purplish; and what is more, their distinctly paleaceous-dilated and flattened pappus-bristles are those of a genus distinct from either.

These interesting plants of our southern seaboard cannot, I think, be reasonably transferred to *Pyrrocoma* or left in *Aster*. They seem simply to demand the recognition of De Candolle's HELEASTRUM; though this was founded on that one of the three or four species whose pappus-bristles are least dilated, and which in habit is least unlike *Aster*, and which is therefore least worthy of being taken for the type of a genus.

The vegetative characters of the genus, and natural grouping of species, are well given in Gray's *Synoptical Flora*, p. 173, though only as a subgenus of *Aster*. I infer from what is said by Aiton and by Elliott, both of whom knew the living plants, that the disk-flowers, at least in *H. paludosum*, and probably in all, are permanently yellow, *i. e.*, not changing to red or purple. This, if it be true, will stand as an additional character for the genus, the species of which I here enumerate.

1. H. CHAPMANII. *Prionopsis? Chapmanii*, Torr. & Gray, Fl. ii. 245 (1842). *Aster eryngiifolius*, Torr. & Gray, l. c. 502 (1843).—Plant of low pine barrens along the coast of Florida.

2. H. SPINULOSUM. *Aster spinulosus*, Chapm. Fl. 199 (1860).—On the western coast of Florida, in damp pine woods.

3. H. PALUDOSUM, D. C. Prodr. v. 264 (1836). *Aster paludosus*, Ait. Kew. iii. 201 (1789). *Tripolium paludosum*, Nees, Ast. 155 (1832).—Of more extended range, reaching Carolina.

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That group of Asteraceous plants which Dr. Gray, in his latest work, restored to the genus *Aster* with most reluctance is the genus DŒLINGERIA, Nees. This was going counter to the opinions of all the most noted synantherologists of the century. Cassini, Lessing, Nuttall, De Candolle, even Gray himself until late in his career, excluded these plants from *Aster*. Indeed one must go back to the times of Linnœus and Miller, to the days when as yet the Compositæ had been studied only superficially, to find many botanists of note calling these asters. Even since I began this article, an accomplished botanist not long in this country, but zealously studying our flora, has brought me a good sheet of *D. umbellata* to ask in what genus he should look for it. He had not thought of looking under *Aster*. "It cannot be of that genus, surely!" In mode of growth the plants all diverge from *Aster* in a manner which has hardly yet been pointed out, though Nees observed it in one of the species. All true asters have their broadest and amplest leaves at the base of the stem or arising from the root. DŒLLINGERIA, on the contrary, not only has no radical leaves, but the lower part of the stem bears instead of leaves a few small bracts, these in some species being thin, appressed to the stem, and even embracing it as a sheath; and from these sheathing bracts there is a more or less gradual transition to the proper leaves higher up the stem. This most marked vegetative character, along with the entire leaves, cymose rather than panicled heads, double pappus and

obovoid achenes, are marks which, even in the dead and dry materials of the herbarium, indicate remoteness of affinity for that vast genus of which *Aster Amellus* is the type. In two particulars do the disk-corollas of DŒLLINGERIA differ from those of *Aster*. The distinction of tube and limb is much more pronounced, the slender tube expanding quite abruptly into an almost campanulate throat. In color also there is no change. The disk-flowers are from their earliest opening greenish white in the typical species, white in the next, and in the last species they are from pink to deep red-purple, even from the first. In *Aster* it should be well known that the disk-flowers are at first yellow, soon changing to purple or red. The rays in *Dœllingeria* are, I believe, invariably white.

The genus with which *Dœllingeria* should be compared is *Linosyris*, an Old World group, having similar campanulately dilated permanently white disk-corollas, but purplish rays, when rays are present. Its inflorescence is also cymose, as strictly so as in *Dœllingeria;* nevertheless these two are not likely to be combined. They are too unlike in aspect, and in certain vegetative characters, besides having a different involucre.

The synonymy of the earlier species of DŒLLINGERIA is confused to a most extraordinary degree; each one of the specific names having been applied differently by different authors, in such wise that the three classic specific names, *umbellatus*, *amygdalinus* and *cornifolius* have all in turn been assigned to each species. And a most perplexing part of the bibliography is something which all authors hitherto seem to have ignored, namely, that Miller, even, either had two species of *Dœllingeria*, or else two names for one. If he had two species, then what all the world has latterly been calling *Aster umbellatus*, Mill., is really *A. nervosus*, Mill., while the so-called *A. umbellatus*, Mill., may have been *A. cornifolius*.

That our most eminent specialists, quoting Miller as the

first authority for a species of this group, have not taken the trouble to read his descriptions except in the most casual manner, is evinced by the fact that not one of them has mentioned his *Aster nervosus*. Both in Steudel and in the Kew Index this species is presented as a valid one, but for the simple reason that no one has attempted either to reduce it to synonymy, or to deny its validity. It is simply ignored. And yet I say the description reads as if that were the plant which we have all been taking for *umbellatus*. In view of all these intricacies in the bibliography, it seems impracticable to make any alteration of Nees' nomenclature of the earlier species of DŒLLINGERIA.

1. D. UMBELLATA, Nees, Ast. 178 (1832).[1] *Aster umbellatus*, Mill. Dict. (1768)? Ait. Kew, iii. 199 (1789)? *A. nervosus*, Mill., l. c.?—Both Miller's plants, whatever they may have been, were from Pennsylvania. Nees, whose diagnosis of the species was drawn from materials both of garden and herbarium, gives its range as from Canada to Carolina, and says that the muricate-roughened angles of the stem are the most essential specific character.

2. D. AMYGDALINA, Nees, l. c. 179. *Aster amygdalinus*, Bertol. Misc. vi. t. 5. f. 1 (1842), probably also of Lam. Encycl. (1783). *Aster umbellatus*, var. *latifolius*, Gray, Syn. Fl. 197 (1884).—According to Nees this has its stem-angles perfectly smooth, and its involucral bracts loose, that is, not appressed. In the herbarium specimens seen by me, the bracts are more numerous and more imbricated than in the preceding.

3. D. INFIRMA. *Aster caule infirmo*, etc., Gronov. Fl. Virg. 99 (1739). *Aster infirmus*, Michx. Fl. ii. 109 (1803). *A.*

[1]Although this book has constantly been cited, according to its title page, as of the year 1833, it is evident that it was in the hands of botanists as early as the middle of 1832. Lindley, under plate 1527 of the *Botanical Register*, praises the work; and under plate 1500, issued in June of that year, he quotes it.

*cornifolius*, Muhl. in Willd, Sp. iii. 2039 (1803). *Dœllingeria cornifolia*, Nees, Ast. 181 (1832).—Differs from both the preceding by a terete stem, with only some scabrous lines running down from the bases of the leaves; the involucral bracts not as numerous and broader; inflorescence more simple and corymbose.

4. D. RETICULATA. *Aster reticulatus*, Pursh, Fl. ii. 548 (1814). *Chrysopsis obovata*, Nutt. Gen. ii. 152 (1818). *Aster obovatus*, Ell. Sk. ii. 368 (1824). *Dœllingeria obovata*, Nees, Ast. 182 (1832).—The most southerly species, and a beautiful one, but much in need of investigation, for, as here received, it may be an aggregate of several.

It is well known that Nees referred doubtfully to this genus the plant latterly known as *Aster ptarmicoides*, Nuttall's *Chrysopsis alba*. As far as the floral characters are concerned, it is more like *Dœllingeria* than *Aster*, but it recedes too far from the present group in point of habit. It is a very perplexing plant, and has been such, to all real students of Asteraceæ, ever since its discovery, as the bibliography demonstrates.

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There is another northeast American species which might more easily than *A. ptarmicoides* be referred to *Dœllingeria*, and that is *Aster nemoralis*. Nees excluded it from *Aster*, joining it to *Galatella* however, and not to *Dœllingeria*.

Its nearer affinity, as I view it, lies with a far-western group to which Nuttall assigned the generic name EUCEPHALUS. These plants resemble *Dœllingeria* in certain vegetative characters quite closely. The stems are as equably leafy; the lower stem-leaves are in the same way reduced to mere scale-like bracts; radical leaves there are none; the inflorescence is yet more simple and corymbose. Nevertheless, the group does not look like *Dœllingeria*. Moreover, the flowers in form and color are more like those of genuine *Aster*. But the involucre, at least in the typical species, is

of a nature equally foreign to those of both *Dœllingeria* and *Aster*. Its much imbricated bracts are broad, erect, and either carinate very distinctly, or at least carinately nerved. The pubescence, when any is developed in the group, is not at all that of any *Aster* species, but rather such as appears in *Chrysopsis*. The first species of this group which I had to describe as new, I published as a *Sericocarpus*, not at the time recalling Nuttall's long suppressed genus, and perceiving my plant to be, at all events, a thing naturally foreign to *Aster*, and more nearly a *Sericocarpus*. I afterwards learned that Nuttall himself had noted an affinity between *Eucephalus* and *Sericocarpus*, and that he had observed the upwardly dilated pappus-bristles to be equally characteristic of both.

Of EUCEPHALUS I distinguish readily the following species:

1. E. ELEGANS, Nutt. Trans. Am. Phil. Soc. vii. 298 (1840). *Aster elegans*, Torr. & Gray, Fl. ii. 159 (1841).—Of the northern Rocky Mountains and westward, always at considerable elevations. Stems slender, very leafy; leaves entire, acutish; herbage of a vivid green but minutely scabrous; heads few, the involucres purplish, the bracts so neatly cut and imbricated as well as colored that the species well merits its name.

2. E. ENGELMANNII. *Aster Engelmannii*, Gray, Syn. Fl. 199 (1884), at least in large part, but excluding the named varieties. Plant tall and robust, with few and corymbose large heads with rose-purple flowers: leaves numerous, large, thin, acute, glabrous, scarcely even the margin scabrous: bracts of involucre lanceolate, glabrous except the margins, which are often densely woolly-ciliate: pappus-bristles slender, some abruptly dilated below the acute summit; achenes elongated, sparsely silky-pubescent.

Fine specimens of this most beautiful species have now come in from beyond the British boundary, in Mr. Macoun's collection of 1895, and are distributed under his number 10236.

3. E. SERRULATUS. Stoutish and rather tall, vivid green and scabrous, the leaf-margins even serrulate-scabrous under a lens: leaves linear-lanceolate, 2 inches long, acute, marked by a very strong and conspicuous white midvein and some reticulation of the surface: heads few, large as in the preceding, but bracts very different, being narrow and almost wholly herbaceous and taper-pointed, the margins serrulate-scabrous, not woolly or ciliate.

Grassy hillsides on Mt. Paddo, Washington, collected by Mr. Suksdorf (n. 1563) and distributed for real *E. Engelmannii*, from which it is most distinct, though doubtless confused with it by Dr. Gray.

4. E. LEDOPHYLLUS. *Aster Engelmannii*, var. *ledophyllus*, Gray, Proc. Am. Acad. viii. 388 (1872); Syn. Fl. 200.—Seldom 2 feet high, strict and rather slender, with few and rather large corymbose or somewhat racemose heads: leaves oblong or oblong-lanceolate, 1 to 1½ inches long, obtuse or acutish, mucronate, loosely cottony-tomentose beneath: bracts of involucre firm, ovate-lanceolate and lanceolate, the margin scarcely ciliolate: rays few, purple: achenes glabrous.

At subalpine elevations of the higher mountains of Oregon and Washington.

5. E. TOMENTELLUS. *Sericocarpus tomentellus*, Greene, Pitt. i. 283 (1889). *Aster brickellioides*, Greene, Pitt. ii. 16 (1889), excl. var. *glabratus*.—Distinguished from the preceding by a stouter more branching stem, firmer foliage, oval and oblong-ovate spreading or even deflexed on the stem, the heads rayless, small and panicled at summit of stem; the involucres tomentose; the achenes sparingly villous.

This is as different from *E. ledophyllus* in habitat as in character, that being of moist subalpine meadows; this of dry hills far southward nearer the level of the sea.

6. E. GLABRATUS. *Aster brickellioides*, var. *glabratus*, Greene, Pitt. ii. 17 (1889).

The character of this need not here be reproduced. It is a clear species, of dry pine woods near the summit of the Siskiyou Mountains in extreme northern California and adjacent Oregon.

7. E. GLAUCESCENS. *Aster Engelmannii*, var. *glaucescens*, Gray, Syn. Fl. 200, in large part. Near *E. serrulatus*, but pale and glaucescent throughout, the leaf-margins only remotely and interruptedly serrate-toothed: terminal corymb ample, and heads large, radiate: bracts of the involucre narrow, but not herbaceous, firm and often obscurely triple-nerved, with a narrow and thin scarious margin: achenes pubescent.

My type for this is Mr. Suksdorf's n. 118 of my own herbarium; the specimens obtained on Mt. Paddo (Adams), Washington. The species is doubtless subalpine.

8. E. GLAUCUS, Nutt., Trans. Am. Phil. Soc. vii. 299 (1840). *Aster glaucus*, Torr. & Gray, Fl. ii. 159 (1841).—Very common in the middle Rocky Mountain region, in dry clayey soil at middle altitudes, from Colorado and Utah northward well towards the British boundary.

9. E. PAUCICAPITATUS. *Aster paucicapitatus*, Rob., Proc. Am. Acad. xxix. 329 (1894).—Simple monocephalous stems decumbent at base, 6 to 18 inches high; herbage glandular-puberulent, even somewhat scabrously so, only the margins of the oblong-lanceolate obtuse thinnish leaves minutely woolly-ciliolate: bracts of the broad involucre not very unequal or much imbricated, lanceolate and herbaceous, though with a distinct carinate midvein: rays few, their color doubtful: pappus rather copious and fine, the bristles in no degree dilated upwards: achenes sparsely appressed-pubescent.

Of the Olympic Mountains, Washington, 30 Sept., 1890, C. V. Piper. The most northwesterly species of the genus, and doubtless of limited range. The rays are said to be white or pink. Were they yellow, it would be impossible to place the plant in any genus separate from that which should include the "*Aplopappus Lyallii*" of the far Northwest. But, between the foregoing members of the present series and the concluding one, this is a very fair connecting link. I do not know what Nuttall or Asa Gray would have thought of the curious proposition that this plant is related to *Xylorrhiza*.

10. E. NEMORALIS. *Aster nemoralis*, Ait. Kew, iii. 198 (1789). *Galatella nemoralis*, Nees., Ast. 173 (1832).—At perfect generic agreement with *Eucephalus*, of which it is the northeastern representative, inhabiting bogs or wet woods (as do most of the western species) from Newfoundland to New Jersey.

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The characterization of the *Machæranthera* group of *Aster* given in Gray's *Synoptical Flora* (where the plants figure as subgenus number 13 of *Aster*) is indeed very good, as far as it goes, though it leaves unmentioned that very striking character of the anthers which Nees discovered and which gave him the suggestion of the generic name. It also leaves unmentioned those peculiarities of achenes and pappus which furnished Nuttall with some warrant for proposing the genus *Dieteria*. As for the propriety of appending of such a group as this to *Aster*, I must call attention to the fact that this was a view to which none of those excellent synantherologists, Nees ab Esenbeck, Nuttall or De Candolle could subscribe. Nor was it until after Gray had passed the meridian of his best working days that he himself—and even then, apparently only as preferring to yield his former views to those of Bentham, then newly expressed in the *Genera Plantarum*—gave up the maintenance of *Machæran-*

*thera* in generic rank. In 1841 he retained it;[1] also in 1852 and 1853;[2] in 1858;[3] in 1863;[4] even in 1865 he published a new species as *Machæranthera*,[5] and up to 1874 this view is still maintained.[6] Not until 1876, and after thirty-five years' maintenance of the other view, did he yield, hesitatingly, in the *Botany of California* to the proposition that these plants might, as a matter of present expediency, be received as species of *Aster*. His apology is this: "For this flora, at least, it is best to receive it [*Aster*] in the extended form which it reassumes in Bentham and Hooker's Genera Plantarum."[7]

While MACHÆRANTHERA as a genus does not in any way intergrade with ASTER, it does present everywhere marks of a much closer affinity for two other allied genera, namely, *Corethrogyne* and *Lessingia*. Nothing of any more importance than the turbinate and densely villous achenes of the former stands in the way of its being merged in MACHÆRANTHERA; and Gray, in the *Synoptical Flora*, admitted to the group, and in the face of the fruit character assigned to it, two species having achenes and pappus entirely diverse from those of true MACHÆRANTHERA. Those two were referred by me to the genus *Eriocarpum*.[8]

The ray-flowers are always purplish or red, as far as known; but in one species there are no ligules. The disk-corollas are yellow, changing to red or brown. The typical species are strictly annual, and belong to Mexico and the southeastern borders of the United States. The largest proportion of the species are of the Rocky Mountain region and the remoter West. Several of these are biennial, some ap-

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[1] In Torr. & Gray, Fl. ii. 99, under the name *Dieteria*.
[2] In Plantæ Wrightianæ, i and ii.
[3] In Botany Mex. Boundary.
[4] In Enum. Pl. Parry, Hall and Harbour.
[5] Proc. Am. Acad. vi. 539.
[6] Porter & Coulter, Fl. Colorado.
[7] Bot. Calif. i. 321.
[8] See ERYTHEA, ii. 109, 110; *E. gymnocephalum* and *E. Coloradense*.

parently really perennial, though never with that proliferous or stoloniferous underground spreading and propagation which characterizes *Solidago* and true *Aster*.

* MACHÆRANTHERA proper. *Root annual; stem diffusely branched; leaves* 1—3-*pinnately cleft; achenes terete, strongly striate.*

1. M. TANACETIFOLIA, Nees, Ast. 224 (1832). *Aster tanacetifolius*, HBK. Nov. Gen. & Sp. iv. 95 (1820).—For other synonymy of this southerly species, see Gray, Syn. Fl. 206.

2. M. PARVIFLORA, Gray, Pl. Wright. i. 90 (1852). *Aster parviflorus*, Gray, Bot. Calif. i. 322.—Of southern Arizona and New Mexico.

** Subgenus DIETERIA. *Biennials and perennials; stems paniculately or even virgately branched; leaves of firm texture, merely toothed, sometimes entire; achenes compressed, less striate.*

3. M. CANESCENS, Gray, Pl. Wright. i. 89 (1852), excl. var. *Aster canescens*, Pursh, Fl. ii. 547 (1814). *Dieteria canescens*, Nutt., Trans. Am. Phil. Soc. vii. 300 (1840). Biennial, erect, seldom a foot high, fastigiately or more corymbosely branching, the herbage canescently puberulent: early cauline leaves (fallen before the flowering) spatulate, commonly with a few serrate teeth; those of the branches linear, or at least narrowly oblanceolate, entire: bracts of the involucre in about 3 series, their lanceolate green tips ascending or slightly spreading: rays rather deep blue than purple.

Exclusively a northern plant, of Dakota and northward and westward along the British boundary. It is the plant of Pursh beyond all doubt, and of very marked habit. Mr. Canby long ago distributed representative specimens from several localities in Dakota, and Mr. Macoun as recently as 1895 obtained a fine series in Assiniboa; his n. 10230 showing the plant well in flower, with radical and early cauline

leaves wanting, as they always are in this species at that stage; his n. 10232 exhibiting an earlier stage, just beginning to flower; 10234 with only one head in flower, displaying all the leaves, the radical ones being entire, the proper cauline serrate-toothed, those clothing the branchlets at time of maturity and full flowering not yet developed. All the species immediately succeeding in this enumeration are of different habit, none of them like this low and corymbose, nor having their flowering branches clothed with those many ascending entire narrow leaves.

4. M. SESSILIFLORA. *Dieteria sessiliflora*, Nutt., Trans. Am. Phil. Soc. vii. 301 (1840). Biennial, stout, erect, with few stout ascending branches, all leafy throughout, the heads subsessile in the axils of the green and almost glabrous leaves: turbinate heads $\frac{1}{2}$ inch high; bracts of involucre in as 5 series, mainly uncolored, rather thin, the short green tips squarrose: rays purplish, but pale (not "yellow"): pappus whitish, scanty and fragile or deciduous; achenes pubescent.

Certainly most distinct not only from *M. canescens* but from all other species, and of an easterly habitat. The only good specimens seen by me are in the U. S. herbarium and were collected by Mr. Rydberg in the hills of western Nebraska. Nuttall's type, or at least a probable duplicate of it, is in the herbarium of the Philadelphia Academy, and, though small and poor—not yet in flower—is well matched by the excellent ones referred to. Only certain Californian species approach this in habit, though not in character.

5. M. MONTANA. Nearer to *M. canescens* than to the last, but much taller, somewhat paniculately and divaricately branched; all the leaves relatively narrower, the lowest only oblanceolate, the rameal few, spreading rather than ascending, lanceolate rather than oblanceolate and all saliently serrate-toothed: bracts of the involucre in 4 series, with long and narrow squarrose herbaceous tips.

Frequent at low altitudes from the high plains of Wyoming to the eastern slope of the Californian Sierra; possibly including Nuttall's *Dieteria pulverulenta*, or *divaricata*, or *viscosa*, or all three; but I have seen no types of these, and am not able to make out from the descriptions what they should be. I therefore deem it unwise to attempt to apply any of those names.

6. M. LEUCANTHEMIFOLIA. *Aster leucanthemifolius*, Greene, Eryth. iii. 119 (1895). Since this was published I have found it well to the northward of the original station, in the West Humboldt Mts., Nevada. Some of Mr. Shockley's specimens distributed are depauperate and poorly illustrate the species. The type specimen is in the herbarium of the California Academy.

7. M. LÆTEVIRENS. Perennial, rather small and slender, branched only sparingly, and that terminally and corymbosely, only the involucre puberulent, all the herbage bright green and glabrous: radical leaves obovate, entire, obtuse, prominently cuspidate-mucronate, tapering to a petiole as long as the blade; cauline narrower, some oblanceolate and serrate, others quite entire: bracts of the rather narrow involucre of firm texture, the short green tips pungently acute, seldom recurved: rays few, violet: achenes hispidulous; pappus firm.

Foothills of the Clover Mountains, Nevada, July, 1894.

8. M. SHASTENSIS, Gray, Proc. Am. Acad. vi. 539 (1865). *Aster Shastensis*, Gray, Bot. Cal. i. 323.—Biennial or perennial, of the size and habit of the preceding, but finely and pulverulently or granularly puberulent throughout, and the involucral bracts and lower parts of the plant purplish; leaves all oblanceolate, entire, abruptly acute but not mucronate: heads turbinate, the oblong-linear scarcely acute bracts erect even to the tips, where they are ciliolate-margined:

rays few, rose-purple: the striate achenes sparingly appressed-pubescent; pappus firm.

Northeastern California, in Modoc Co., M. S. Baker, 1893; but described originally, by Gray, from dwarfed subalpine specimens obtained on Mt. Shasta by Brewer.

9. M. INORNATA. *Aster inornatus*, Greene, Eryth. iii. 119 (1895).—Species so far as known quite local on the plains of Siskiyou Co., Calif., beyond Mt. Shasta. It is wholly distinct from the plant which Gray called *A. Shastensis eradiatus*, which he also had from me, but from another region.

10. M. INCANA. *Diplopappus incanus*, Lindl., Bot. Reg. t. 1693 (1834). *Dieteria incana*, Torr. & Gray, Fl. ii. 100 (1841). *Aster incanus*, Gray, Bot. Calif. i. 322 (1876).—This is a plant of California derivation, but not yet positively identified in the field. What I take to be probably the same I cultivated for several seasons in California, the young plantlets having been sent me from Kern County. But this was a tall and robust, loosely branching winter annual. The leaves are acute, and the bracts of the involucre more elongated and slender than represented, and also in no degree glandular. No *Machæranthera* is found in those parts of California supposed to have been Douglas' only field of exploration. But, if he penetrated the interior somewhat further to the southwestward than he is supposed to have done, he may have obtained the plant known to me.

11. M. ASPERA. Biennial, stoutish, freely branching, 2 or 3 feet high, rough throughout, with a gland-tipped indument which is short and scabrous on the leaves, longer and hispidulous on the stem and branches: cauline leaves oblong-lanceolate, sessile by a broad half-clasping base, spinulosely serrate-toothed: heads large, somewhat racemosely disposed at the ends of the branches; involucres hemispherical, with long lanceolate spreading herbaceous tips, these

glandular-scabrous: achenes compressed, cuneate-oblong, striate, strigose-pubescent.

Very common in dry ground at altitudes of 7,000 to 9,000 feet in the mountains and small parks of middle Colorado east of the main range. A most beautiful species, and none of the descriptions by Nuttall, or Gray, touch this; though it constitutes a very considerable part of the Colorado "*Aster canescens*" of the catalogues and herbaria.

12. M. Pattersonii. *Aster Pattersonii*, Gray, Proc. Am. Acad. xiii. 272 (1878).—A subalpine species, somewhat near the last, but with a cottony pubescence.

13. M. Bigelovii. *Aster Bigelovii*, Gray, Pac. R. Rep. iv. 97, t. 10 (1857).—A large-flowered very showy and distinct New Mexican species.

14. M. asteroides. *Dieteria asteroides*, Torr., Emory's Rep. 142 (1848).—Of the arid regions between Texas and Arizona; perhaps as here received an aggregate of several species; but the type, as Dr. Torrey said so long ago, is not to be confused with the far northern species.

# Economic Botany of Southeastern Alaska.

By M. W. Gorman.

The opinion which I formed regarding the flora of Alaska during my first season there (1890), namely, that it is rich in individuals of a limited number of species, I am now, after five seasons' residence there, able confidently to affirm. On crossing Queen Charlotte Sound a material change in the flora is readily noticeable and some of the most familiar plants and trees of Vancouver Island, such as Ranunculus occidentalis, Berberis aquifolium, Achlys triphylla, Arabis hirsuta, Cerastium avcense, Claytonia exigua, Trifolium oliganthum, Ribes Lobbii, Saxifraga integrifolia, Lithophragma parviflora, Peucedanum utriculatum, Valeriana capitata, Phlox gracilis, Collinsia parviflora, Mimulus alsinoides, Pseudotsuga mucronata, etc., at once disappear.

The great uplift which has taken place on the north Pacific coast since the Ice age, commencing about Millbank Sound and culminating in the vicinity of north lat. 56°, where it amounts to about 1,500 to 1,800 feet, still further increases the change in the flora. A great part of the present coast line and many of the outlying islands from Millbank north to Cross Sound appear to have emerged from the water in comparatively recent times, as is amply evidenced by the entire absence of glaciation near the present sea level and by the presence of clam-shells in fresh-water streams near the coast, the result being that the coast flora of Washington and British Columbia has been slowly extending its limits northward, while the Alpine flora has been working its way down nearer to sea level by means of the upland meadows, sphagnous marshes, and landslides. In southeastern Alaska

the botanizing ground appears to be divided into five classes: 1st, the beach; 2nd, the coniferous woods; 3rd, the sphagnous marshes; 4th, the upland meadows, and, 5th, the mountains. Of these the first is undoubtedly the most varied, and the second the least so. The margins of the many deserted and diminishing beaver ponds furnish a few additional plants, such as Lycopus Virginicus, Scheuchzeria palustris, Eleocharis, Utricularia, etc., that are rarely if ever found in any of the other localities; but these ponds are scarcely sufficient to be placed in a class by themselves.

The lack of soil in this region is somewhat remarkable. The surface of the country is generally a mass of moss-covered rocks from the seashore to the mountain sides, the only exceptions to this rule being the sphagnous marshes, the upland meadows, and the few deltas which have been deposited at the mouths of the larger streams.

Notwithstanding this, the whole section is covered with a heavy growth of conifers, and at all the lower elevations with a dense undergrowth of the various shrubs.

To one newly come, this great forest growth appears hard to account for, but after a residence of a few years it is readily explained by the humid atmosphere and the prevailing rains of the summer season, which are so continuous that the moss covering the surface never dries.

The size of the trees near sea level somewhat exceeded my expectations for this latitude, some specimens of Picea Sitchensis and Thuya gigantea being found fully 5 feet in diameter, the former 200 feet high. During my first season I concluded that there were only 7 species of conifers to be found in this locality (56° north), viz: Juniperus nana, Chamæcyparis Nutkaensis, Thuya gigantea, Tsuga Mertensiana, T. Pattoniana, Picea Sitchensis, and Pinus contorta. I now believe there are 10 and possibly 11; for, in addition to the above, Taxus brevifolia has been found on Annette and Gravina Islands, though I have not observed it on the mainland; Tsuga Pattoniana var. Hookeriana, an Alpine variety

with erect cones, and a tall pine growing on the borders of sphagnous marshes which I take to be Pinus Murrayana; besides these, some prospectors who have been up the Junock River have reported to me that there is a spruce there which differs materially from P. Sitchensis. Of these the only ones that come down to the shore are Thuya, Tsuga Mertensiana, and Picea Sitchensis, with occasional patches of Chamæcyparis; Tsuga Pattoniana and Pinus being rarely if ever found on the seashore. In a former issue of the "Pacific Coast Pilot for Alaska" (1883) it is stated that in one or two places certain "points" or "landmarks" are densely timbered with "fir" or covered with "pine," but this is an error, as no fir whatever grows in Alaska (except a few trees of Pseudotsuga mucronata which have been introduced at Sitka) and pine does not grow in quantity anywhere on the shore.

The tourist, on observing the forest from the steamer's deck (the point of view from which too many "books" on Alaska are written), is apt to underestimate the distance and conclude that the timber here is scrubby; but a closer inspection soon dispels this impression, as noted above. In this clear atmosphere the pale green of the Cedar and Cypress, the dark green of the Hemlock, and the bluish green of the Spruce are readily distinguished at three miles' distance.

Chamæcyparis Nutkaensis (Alaska Cedar, Alaska Cypress), in Tsimsian, Weht-uhl, is undoubtedly the most valuable timber tree of this region. Though not large (rarely exceeding two feet in diameter), it makes excellent finishing lumber, being firm, close-grained, not inclined to warp, and readily taking a high polish. It is not large enough for making canoes, but being light and strong it is the ideal wood for paddles, and is universally used by the natives for that purpose. It is also the wood most used in this section for making oil-crates, native boxes, bowls, dishes, bailers, masks, spoons, and household utensils of various

kinds. Some of these boxes are nicely inlaid with small water-worn pebbles and show very creditable workmanship. The fine roots of the young trees of this are split and used for the framework of some of their baskets and in making the native hats.

PICEA SITCHENSIS (in Tsimsian, SCHAMIN) is decidedly the most plentiful timber tree in Alaska (being probably equal in quantity to an aggregate of all the others). It occurs from sea level to about 3,000 feet elevation, but rapidy declines in size as it ascends above 800 feet. It is extensively cut into lumber in all the saw-mills in the territory. Being straight-grained, fairly dry, and splitting readily, it is the wood most used as fuel, though its heat-giving qualities are not equal to those of Chamæcyparis, Thuya, or of Tsuga Mertensiana when seasoned. Further north, where Thuya is not to be found, it takes the place of that tree for many purposes with the natives, such as for building houses, canoes, oil-crates, etc. Judging from two of these trees which I measured and the annual rings of which I counted, some of them now standing must be over 500 years old. The measurements are as follows: No. 1, cut on the mainland—height, 166 feet; diameter across stump, 3 feet 11 inches; number of annual rings, 277. No. 2, cut on Hassler Island—height not measured; diameter at 14 feet from ground, 4 feet and $\frac{1}{2}$ inch; number of annual rings, 434. The apparent discrepancy between the diameter and the number of annual rings in these two specimens was readily explained on examining the stumps. No. 1 grew in a fairly dense woods on the mainland, well protected from the winds, and the heart was found to be in the center, while No. 2 grew on a hillside on Hassler Island, exposed to the fierce northeast gales which prevail there in fall and winter, and the heart was found to be 32 inches from the southwest side and only $16\frac{1}{2}$ inches from the northeast side.

THUYA GIGANTEA (Red Cedar), Tsimsian, KUHL-LAH-OOH, comes next to the spruce in point of size, is sometimes used as fuel, and is put to many more uses by the natives than that tree, being universally employed for making canoes in southeastern Alaska (one canoe which I examined being 52 feet long, 6 feet $6\frac{1}{2}$ inches beam, and 33 inches deep); it is also in requisition for totem poles, house-building (in which case it is split into slabs about 3 inches thick), and various other domestic uses. The bark is extensively used for making mats, baskets, etc. In early spring, during the herring run, the smaller branches of this tree, also those of Chamæcyparis and sometimes of Pinus, are set in the sand at low tide (the tides here being about 24 feet) by the natives. During the flood tide the herring deposit their spawn on the branches, which are subsequently removed at low tide and hung upon lines to dry, either in their huts or preferably in the open air, if the weather be clear. When dry the roe-covered branchlets are removed from the branch and rolled up in bark mats for future use. This is considered a great delicacy by the natives, and is one of their few salt foods in use among them. The branches of Picea and Tsuga are not suitable for this purpose, the foliage dropping off too readily when dry.

TSUGA MERTENSIANA (Hemlock), in Tsimsian KYEE-UK, is probably next to spruce in quantity, and exceeds it in altitude on the mountain sides where it reaches snow-line. When freshly cut it is almost worthless as fuel, owing to its excessive moisture; but when cut and kept under cover for a year it is preferable to spruce. It is one of the valued sources of vegetable food of the natives, the inner bark being made into cakes about eleven inches square, which, when baked and smoked properly, are not unpalatable and will keep indefinitely. In Tsimsian this bread is called K'SHEEO.

TSUGA PATTONIANA (Alpine Hemlock), Tsimsian, LOO-YOH, although known as the Alpine hemlock, I have occasionally

found this tree growing at sea level. It is seldom found large enough for lumber purposes, and on the mainland is mostly confined to the borders of sphagnous marshes, but on Kuiu Island there are a few small groves containing trees of two feet or more in diameter which are being used for lumber under the name "red spruce."

TSUGA PATTONIANA, var. HOOKERIANA. This is pre-eminently an Alpine tree, being found at the highest altitude reached by trees in this region—that is, 3,000 to 3,500 feet—where it is twisted and gnarled by the gales so prevalent there, and, although frequently found only 8 to 10 feet in height, it is still well laden with small, strictly erect, purple cones.

PINUS CONTORTA (Scrub Pine), Tsimsian, SHKIN-EESH. This tree is generally confined to lake borders and margins of sphagnous marshes, being crowded out of the forest by the more prolific growth of Picea, Tsuga Mertensiana, and Thuya. It is comparatively scarce, and its only economic use is for fuel, except that by the natives its inner bark is still occasionally used as food, being eaten freshly cooked, and not kept for future use as is the inner bark of T. Mertensiana.

PINUS MURRAYANA (Lodge Pole Pine, Tamarack Pine) has much the same habitat as the last; in fact, the specimens which I sent down in 1890 were identified as P. contorta, but this I am not yet willing to accept, as it does not answer the description of the latter; one specimen that I saw on Square Island being over 100 feet in height and 18 inches in diameter at stump height.

TAXUS BREVIFOLIA (Yew), in Tsimsian, SHOWK-TUK, might almost be classed as a shrub in this region, but it is of considerable economic value to the natives, among whom it is used for knife and tool handles of various kinds. Being

hard and close-grained, it is also the favorite wood among the different coast tribes for constructing the lower half of their halibut hooks, its specific gravity being greater than that of cedar, of which the upper half is usually made. These hooks are frequently covered with certain native musical signs, and when they are being set a song is usually sung to the air denoted by these signs for the purpose of ensuring a successful catch. I have had the experience of listening to some of this music, and can only say that if the fish are charmed by it there is no accounting for musical tastes.

ALNUS RUBRA (Mountain Alder, Red Alder). This may be said to be the only deciduous tree to be found in southeastern Alaska, and on creek bottoms it sometimes attains the diameter of one foot. It is the wood used by the whites for smoking salmon and halibut, but not by the natives, who prefer decayed wood of the conifers for this purpose. When straight-grained and free from knots I have sometimes seen them use it to make paddles. It can be found on the mountains up to snow-line, but its favorite habitat is the site of land and rock slides so common in this region, where it soon takes possession to the complete exclusion of the conifers which previously reigned supreme. In this kind of situation it is of uniform size and sometimes in thickets of such density as to be almost impenetrable.

ALNUS INCANA var. VIRESCENS (Swamp Alder, Beach Alder) is very abundant on the seashore and the wet creek banks, and is sometimes found on the lower ends of landslides if they are sufficiently moist. On the beach I have frequently seen the roots submerged at new moon high tide without the tree receiving the least apparent injury.

MALUS RIVULARIS (Crab-apple) is quite plentiful along the shores, but I have never found it any distance from the coast. On bays or hillsides with southwestern exposures the fruit

becomes fairly ripe about the first week in October and is relished by the natives, but I found it rather too sour to be agreeable. By the Tlingits it is called K'HAWK, and is generally eaten raw, but sometimes put up in seal or ulikon oil for winter use.

AMELANCHIER ALNIFOLIA (Service Berry) is not abundant, but when fully ripe (about the end of September) the fruit is very palatable and highly prized by the natives, who eat it fresh.

SAMBUCUS RACEMOSA (Elder) is not uncommon in open spaces near the beach, where it bears immense clusters of bright red berries that are eaten by the Stickines, but not by the Tongass or Cape Foxes, who, however, sometimes use it to make "Hoochinoo," the native "Moonshine."

VIBURNUM PAUCIFLORUM (High-bush Cranberry), in Tlingit KUH-WHAIGH, is fairly plentiful along the moist creek and lake banks, flowering about the first of June. The fruit ripens about the beginning of October, most of it persisting on the branchlets until the following season. It is rather acidulous to the taste, but the flavor is much improved where it has a sunny exposure, and it is highly valued by all the native tribes, who not only eat it fresh, but gather it in great quantities for winter use. It is preserved by being placed in cypress or spruce oil-crates, holding each about a bushel, and seal or ulikon oil is poured in until the interstices between the berries are filled. It is then put away until required.

RIBES BRACTEOSUM (Wild Currant), in Tlingit SHOH, is the most abundant of the three or four currants found in this region, growing plentifully along moist creek banks and deltas. The fruit when ripe is quite palatable where it has had a sunny exposure, and is greatly relished by the natives, who not only eat it fresh, but also mix it with red and blue

huckleberries, and after boiling these for about half an hour one pound of silver salmon roe thoroughly pounded is added to about five gallons of the mixed fruit and the whole again boiled for a half or three-quarters of an hour, when it is poured into five-gallon oil-cans or oil-crates and put away for the winter. The addition of the salmon roe is for the purpose of preventing fermentation, which would otherwise promptly set in and spoil the fruit.

RIBES LACUSTRE var. PARVULUM is comparatively rare, being only found on landslides and rocky bluffs, where it appears to maintain a precarious existence. It is evidently not at home here, being either out of its proper habitat or being crowded out by the dense growth of the other shrubs. The fruit when fully ripe is of good flavor and is eaten fresh by the natives, but is not to be had in sufficient quantities to be put up for winter use.

FATSIA HORRIDA (Devil's Club). Common names in general are not very accurate, but this one appears to be well chosen, for any shrub or plant more productive of ill temper in a traveller I do not know. It is the only shrub that in this region exceeds the dimensions which it attains further south, where it is a straggling shrub about six feet high, while here it is frequently twelve feet high and sometimes two inches in diameter. The bark, leafstalks and midribs of the leaves are covered with sharp prickles which break off at once on entering the skin or clothing and make life a burden to the prospector, explorer, or mountain-climber. Its favorite habitat is moist canyons, creek banks, and occasionally moist mountain slopes. Fortunately, it does not grow on the ridges, and one soon learns to keep on the ridges and avoid the hollows and canyons as much as possible. The prickles will penetrate any clothing except leather or rubber, and when allowed to remain in the flesh will frequently cause suppuration. The natives sometimes eat the young

succulent stems as food, and boil the bark, drinking the decoction as a medicine. In former times the shamans or sorcerers (in Tlingit Sheh-shooh) chewed the roots, swallowing the juice, in the belief that it augmented their hypnotic powers.

VACCINIUM PARVIFOLIUM, Tlingit, KLAIH-KOH-THUNK, (Red Huckleberry). V. OVALIFOLIUM var. CHAMISSONIS, V. ——— (Blue Huckleberry). Tlingit, KOH-NUTH-OH, Tsimsian, MYE. These three huckleberries are very plentiful in all parts of southeastern Alaska, flowering in April and early May and fruiting abundantly in July and August; the two latter are seriously attacked by a moth which deposits its eggs in the fruit to develop later as a small worm, but the first escapes this pest for some reason. The other two are also to a great extent free from it when growing in broad river valleys, probably owing to the prevalence of the winds in these exposed sections. So well is this known to the natives that they will sometimes go 50 miles to the mouth of the Junock, or some other large river, to get their winter supply of this luscious fruit. The Tsimsians and Kaigani (Haidas) usually dry them either in the sun or over their camp fires for winter use, when they are eaten with ulikon oil; but the Tlingit tribes generally prefer the method noted above, of boiling them with pounded salmon roe. They are also eaten in enormous quantities in a fresh state, as they can be gathered from about July 20th to September 10th. Some seasons the fruit of the two latter is so sour as to be unpleasant to the palate of any but the natives. This I am at present unable to account for.

VACCINIUM ARBUSCULA, Tsimsian, MEE-HATL, is not nearly so plentiful as either the three just mentioned. Its habitat appears to be the borders of sphagnous marshes, where it is not uncommon. The fruit is much sweeter than that of the others, and is a favorite with the natives, who eat it fresh but do not appear to preserve it for winter use.

VACCINIUM ——— (with bluish foliage) is the only truly Alpine huckleberry to be found here. Its habitat is apparently the mountain slopes and meadows above the general timber line, though I have occasionally found it on marsh borders. The fruit is sweet and luscious and is greatly relished by the natives, who eat it in the fresh state.

RUBUS SPECTABILIS (Salmon Berry) is sometimes found along the beach and in open places where the heavy timber has from any cause been removed; but its favorite habitat appears to be the rich bottom lands along creeks, where it grows from 3 to 7 or 8 feet high, forming dense thickets, sometimes mingled with alder, viburnum, and devil's club, when it forms a thorny and almost impenetrable tangle, through which the explorer will find it almost impossible to make headway in any other way except by crouching and following the trail made by the bear, which burrows a tunnel-like path through it. The fruit varies in color from very light to dark red. In shady canyons it is rather insipid, but on sunny slopes the flavor is good; in fact, my experience has been that a sunny season improves the flavor of all the fruit in Alaska. This kind more closely resembles the raspberry than the blackberry in being readily detachable from the receptacle when ripe, and is well liked by the natives, who eat it both fresh and mixed with seal or ulikon oil, but do not keep it for winter use.

RUBUS CHAMÆMORUS is plentiful in the sphagnous marshes, which appear to be its home. It flowers about the first of June, fruiting in early August. The fruit is of good flavor during a dry or sunny season; but a succession of rainy days about the time of ripening causes it to become insipid. It is even more easily detached from the receptacle than is that of R. spectabilis; consequently to make satisfactory fruiting specimens for the herbarium is difficult. It always flowers abundantly, but some seasons fruits very sparingly, perhaps because of frost at the time of flowering.

CLADOTHAMNUS PYROLÆFLORUS (in Tlingit GHEET-SUN) is the most beautiful shrub to be found in Alaska and is certainly entitled to the honor of being the State flower. Its height is from 4 to 10 feet; its season of flowering from about the first of August to the middle of September, according to elevation. The handsome pink flowers soon drop off; but, as it usually continues well in flower for about a month, it is always a charming sight to the explorer as he emerges from the dense coniferous woods to the upland meadows, the borders of which are its favorite habitat. Sometimes it occurs on landslides, where it has obtained a temporary foothold with other strays, only to be eventually crowded out when the dense undergrowth of alder attains sufficient height.

ACER CIRCINATUM (Vine Maple) is a rare shrub in this region and apparently approaching its northern limit, being found only on dry rocky bluffs and landslides. It is a somewhat remarkable fact that where a slide occurs this shrub will be found growing on it within a year or two, although another specimen of it cannot be found for miles.

MENZIESIA GLABELLA (?). This beautiful shrub is much more common in Alaska than in Oregon and Washington. It grows from 4 to 8 feet high and ranges from sea level to about 2,000 feet elevation, flowering in May and fruiting abundantly in September. The wood is tough and is used by the natives for the framework of some of their coarser baskets, etc., when the willow is not readily obtainable.

MENZIESIA ———, a species with glaucous leaves, closely resembles the foregoing, has about the same range, but is not nearly so common, and appears to prefer hillsides and inland lake shores rather than the sea beach. The bluish shade of the foliage is very noticeable, and differs about as much from the former while growing as spruce does from hemlock; but this difference is not so noticeable in the dried

plants. The leaves of both of these bear in certain localities a thickened fleshy gall, evidently caused by some insect. The natives, particularly the Haidas, are very fond of these galls and eat them raw. The name in Haida is SKLUK-WUD-DISH, from SKLUK-WUN or STL-KWUN, a finger-nail. The flower itself is called TA-HIL.

SALIX SITCHENSIS (Sitka Willow) is the only member of this well-distributed genus that I succeeded in collecting here, though I understand there is another growing on the Junock river. It grows from 8 to 25 feet high and is not at all common, being strictly confined to moist creek banks and deltas, the two localities shunned by Menziesia. It flowers early in June and appears to prefer the lower levels, all that I found being below the altitude of 500 feet. The natives put the young supple twigs to a number of economic uses, such as the frame-work of baskets, frames for stretching skins, etc.

CORNUS CANADENSIS, in Haida TSEK-HUP, is the most universal plant in this region, occurring from sea level up to about 1,000 feet and growing in all coniferous woods. The fruit is eaten raw by the natives, but not much valued by them owing to the thinness of its pulp and the fact that the berries of the three vaccinia first named appear at about the same time. I have frequently seen them mix it with the latter when eaten in the fresh state.

HERACLEUM LANATUM (Cow Parsnip) in Tsimsian PEYINTZ, in Haida T'HL-KATE, in Tlingit YON-A-ETH, is preeminently the "fresh vegetable" of the natives, who gather and eat the succulent leaf-stalks and young stems in enormous quantities, the Kloochmen and children gathering it most of the day when it is in proper condition. It is, however, seldom eaten after the flowering has begun. Its range is from sea level to timber line. It flowers from July until about the end of August, according to elevation, the flowers

having a slight but delicate fragrance. It flourishes best in open places at sea level, where it is about six feet high, but it is also common in rich creek bottoms and deltas.

MENYANTHES CRISTA-GALLI has the widest range in altitude of any plant growing in this region, occurring from snow-line, where it grows in great profusion on the wet slopes, down to sea level, where it finds its way by the medium of the sphagnous marshes, blooming from about the first of June until August, according to elevation. On looking at a mountain side from sea level in early summer one is struck by the vivid green of the slopes in spots near snow-line and is apt to attribute it to the presence of grasses or sedges, but on examination finds it to be this plant. In early fall the first severe frost is readily indicated by the rusty brown appearance of the leaves at these spots long before a killing frost has reached sea level.

CALTHA BIFLORA has about the same range as the last named, but does not reach quite as great an elevation; is more abundant near sea level, and follows the moist creek banks and deltas instead of the sphagnous marshes.

KUMLIENIA COOLEYÆ, Greene (Ranunculus Cooleyæ, of Vasey and Rose), is rather a rare plant, its habitat being clefts in rocky bluffs and cliffs about snow-line, flowering in July about as soon as the snow disappears, the petals dropping off in a few days, the plant rapidly maturing seed. It sometimes, though rarely, finds its way as a waif down to lower elevations by means of lake and beaver-pond margins. The plant bears a closer resemblance to Caltha than to Ranunculus.

GAULTHERIA SHALLON (Sal-lal), in Haida, SKITHAN, is not uncommon on the mainland, where it follows the borders of sphagnous marshes, also hillsides and ridges in the less densely wooded sections, not reaching elevations above 800

feet. So far as my observation goes, the fruit rarely ripens on the mainland before being overtaken by frosts in the fall, and how it continues to propagate under the circumstances is a question. On the open hillsides of Annette, Gravina, and Prince of Wales Islands it grows plentifully, producing abundant fruit of good flavor, which is highly relished by the Tsimsians and Kaigani (Haidas), who eat it fresh in great quantities. Both plant and fruit are of much smaller growth, however, than in Oregon and Washington.

FRITILLARI KAMTSCHATCHENSIS, in Tlingit KOOH, in Tsimsian KUSK-KUM-TSAGICKS (Rice of the earth), grows abundantly on many of the beaches and occasionally on the upland meadows and mountain slopes, where it is, of course, more stunted. The rice-like bulbs are still largely eaten raw by the natives and occasionally dried for future use.

BOSCHNIAKIA GLABRA. This weird, uncanny-looking plant is comparatively rare in this region; is parasitic on the roots of Vaccinium in open woods, both near sea level and on the borders of inland lakes. It grows to a height of from 2 to 16 inches, is quite slender, and is known to the Tlingits under the name of Ass-tlik-nawk. These claim that when it is rubbed on a marten trap when first set in the fall it insures the capture of that animal.

ASPIDIUM SPINULOSIUM var. DILATATUM (Wood-fern) is abundant in rich open woods near sea level, and the rootstock or caudex is highly relished by the natives, who cook and eat it in large quantities, it being the first vegetable food which they obtain in early spring. The method of preparation is as follows: The rootstocks are dug from the ground soon after the snow disappears, before the fronds are developed, and are trimmed and washed. A round well-like hole, 3 feet in diameter and about $2\frac{1}{2}$ feet deep, is then dug, hot stones are placed in the bottom, or stones are placed

there and a fire built upon them until they become hot; the fire is then removed, a layer of damp moss or kelp is laid on the stones and the cleaned rootstocks placed therein until the hole is full. A little water is thrown on the pile, which is then hastily covered with a layer of damp moss or kelp, a couple of cedar-bark mats are laid on and earth to the depth of about 10 inches is put over it. On this a fire is built and kept up all night (about 14 or 15 hours). The next day the contents are taken out and are then ready to be eaten, the outer rind being removed with the fingers or with a small knife. It has a slightly sweetish taste, but is too smoky and tobacco-like in flavor for the average white man's palate, except under stress of hunger, though I have no doubt it is quite nutritious. It will keep for a week or ten days after being cooked, and is called "Ahh" by the Tsimsians, who inform me that it is larger, sweeter, and of better flavor when grown under or in the vicinity of salmon berry bushes. The most notable difference in taste between white men and Indians is, that the former generally prefer a salt taste in food while the latter prefer the smoky flavor noted above.

EMPETRUM NIGRUM (Crow Berry) is very plentiful on the sphagnous marshes, where it grows in great masses on the drier or better drained spots, and occasionally finds its way to the beach, where it forms small patches on sloping moss-covered rocks above high tide. The flowers appear in June and the fruit does not mature until the second season, when it is sometimes eaten by the natives, though not a favorite fruit with them.

LEPARGYREA CANADENSIS. (Soap Berry). I did not find this shrub on any of my excursions, but secured specimens of the pressed berries. It grows along the larger streams back from the coast, shunning sea level, and producing a large-seeded berry, which is gathered in large quantities by

the natives, who press it into cakes about nine inches square and one inch thick; it is then dried and smoked and becomes an article of barter between the various tribes under the name HOCK-THLEIGH. It is usually the final dish presented to guests at their feasts, the method of preparation being to break the pressed cake in small pieces into a large wooden dish containing some water. The contents are then beaten into a froth which is eaten by dipping a wooden spoon (made for the special purpose) into the mass and then drawing the spoon across the tongue, which is loudly smacked to show a proper appreciation of the feast. It is certainly the most villainous-tasting of any of the native foods which I have tried.

LYCOPODIUM SELAGO (?). This occurs from sea level up to about 1,000 feet elevation, on moss-covered rocks and logs, in coniferous woods and sometimes on the borders of beaver ponds, but not in the sphagnous marshes, where its three congeners, L. annotinum, L. clavatum, and L. dendroideum, are fairly common. It is employed by all the tribes along the coast to produce a sort of intoxication, which is induced by simply chewing the stems and swallowing the juice. What the active principle is I am at present unable to say.

SPHAGNUM ——— is very common throughout this whole region, being the prevailing plant of the marshes, where it covers almost the whole surface like an immense superficial sponge and retains the water in large quantities, even where the ground slopes considerably. It is apparently on the increase, growing thicker and retaining more water as time goes on, as is evidenced by the many dead and dying trees (mostly pines) still standing about, while such as have fallen are being slowly but surely buried out of sight. For some reason it is rarely if ever found in flower or fruit in the body of these marshes. It is only in certain small patches on the borders or in isolated spots near the seashore that fructification is developed.

## *Supplementary Geographical, Climatological and Ethnological Notes.*

SPHAGNOUS MARSHES, numerous in all parts of Alaska, are a marked feature in its topography and largely influence its limited flora. They vary in extent from one or two acres to more than a hundred, and though generally nearly flat, they sometimes slope at a considerable angle without in any way changing their general appearance or quality or lessening to any great extent the proportionate amount of water held by the moss-covered surface. They are the favorite habitat of some trees and numerous plants that are driven from the mountain slopes by the cold and from the coniferous woods by the dense undergrowth prevailing there. Among the plants to be found here might be mentioned Coptis trifolia, Nymphæa polysepala (in ponds), Viola Langsdorffii, Viola palustris, Geum calthifolium, Potentilla palustris (in ponds), Rubus Chamæmorus, Drosera Anglica, D. rotundifolia, Aster foliaceus, Andromeda polifolia, Kalmia glauca, Ledum latifolium, Vaccinium arbuscula, V. oxycoccus, V. vitis-idæa, Vaccinium ————, Gentiana Douglasiana, Menyanthes Christa-galli, M. trifoliata, Comandra livida, Empetrum nigrum, Juniperus nana, Tsuga Pattoniana, Pinus contorta, P. Murrayana, Habenaria hyperborea, H. leucostachys, Spiranthes Romanzoffiana (rare), Tofieldia glutinosa, Eriophorum russeolum (rare), Eriophorum polystachyon, Equisetum ————, Lycopodium annotium, L. clavatum, L. dendroideum, Selaginella selaginoides, besides some of the sedges and grasses. While on the borders may be found such plants as Viola glabella, Spiræa Douglasii var. Menziesii, and Aster peregrinus.

UPLAND MEADOWS. This name I use for lack of a better term. The tracts to which I apply it are usually gently sloping, open, treeless reaches, near to, but below timber line, commonly dotted with numerous small ponds, lipped on the

lower sides. In the larger of these ponds Nymphæa is generally found growing. These tracts appear to be the home of the Juncaceæ and Cyperaceæ, with a few of the Gramineæ, while their borders furnish representatives of many orders, such as Poterium medium, Leptarrhena pyrolifolia, Parnassia fimbriata, Cladothamnus pyrolæflorus, Gentiana Menziesii, Spiranthes Romanzoffiana, Veratrum, Scheuchzeria palustris, etc. The soil is very firm, rich, and not excessively wet; therefore why they are entirely treeless, while surrounded by trees, I am unable to determine.

LANDSLIDES usually occur in March, though I have seen one take place in May. They are from a few square yards to several acres in extent, and are caused by the water from the melting snow freezing in the rocky crevices at night and by expansion displacing the rock, which, once started, may carry hundreds of trees and thousands of tons of rock to the level ground below or, more frequently, into the sea, for most of them occur near the seashore. Although previously covered with conifers, not a single conifer, as a rule, is to be found in the new growth, which consists of the two species of alder, an occasional vine maple, Rubus spectabilis, Ribes lacustre var. parvulum, Romanzoffia Sitchensis, Epilobium, Arabis, Campanula, Aquilegia, etc., together with a few Alpine waifs, such as Leptarrhena pyrolifolia, Parnassia fimbriata, Cassiope Mertensiana, Cassiope lycopodioides, Cladothamnus pyrolæflorus, Lycopodium alpinum, etc., all of which, however, disappear in the course of a few years as the alders attain sufficient growth to crowd them out. One of these slides close by the sea, which I examined in 1890, contained the above six Alpine plants. On returning to it in 1895 the only one of these still holding its ground was Cladothamnus. Leptarrhena and Cassiope Mertensiana were present, but no longer strong enough to flower, while the others had quite disappeared.

To one who has been used to botanical collecting in the clear atmosphere and dry climate of southern Oregon or California this region is particularly trying. The prevalent rains and almost continuously overcast skies render the greatest care imperative in order to secure good specimens, and it is necessary to change driers twice and in some instances three times a day in order to have satisfactory results with certain plants. Among the most difficult might be named Nymphœa polysepala, Viola Langsdorffii, Fatsia horrida (both flower and fruit), Sambucus racemosa (flower and fruit), Boschniakia glabra, Habenaria hyperborea, H. leucostachys, and Lysichiton Kamtschatcense. An alcoholic solution of bichloride of mercury is serviceable in preventing mildew in such plants while in process of drying.

The quantity of rain which actually falls does not give a non-resident a proper idea of the difficulties of botanizing in such a climate, as the number of rainy days in proportion to the amount of rain is much greater than in the prairie States, while the proportion of cloudy days and the consequent difficulty of drying specimens is still greater.

To better illustrate the meteorological conditions, I give herewith a record for the months of June, July, and August, the three least humid months of the year, for the seasons of 1892, 1893, 1894, and 1895.

| | 1892. | | 1893. | | 1894. | | 1895. | |
|---|---|---|---|---|---|---|---|---|
| | No. of rainy days. | Rain. | No. of rainy days. | Rain. | No. of rainy days. | Rain. | No. of rainy days. | Rain. |
| | | *Inches.* | | *Inches.* | | *Inches.* | | *Inches.* |
| June | 19 | 3.62 | 22 | 4.60 | 21 | 3.57 | 21 | 6.77 |
| July | 23 | 6.81 | 22 | 9.26 | 20 | 8.97 | 17 | 5.85 |
| August | 28 | 10.61 | 24 | 12.70 | 19 | 9.49 | 26 | 8.68 |
| Total for 3 months | 70 | 21.04 | 68 | 26.56 | 60 | 22.03 | 64 | 21.30 |

There is, however, a compensation for this excessive moisture in the entire immunity of this region from such forest fires as annually make such havoc in the coniferous woods of the Pacific coast from British Columbia to California.

The number of fragrant plants to be found in Alaska is very small even for the limited flora of this region. Those which I met with are as follows:

| | |
|---|---|
| Actæa arguta, | Angelica genuflexa, |
| Galium triflorum, | Hierochloa borealis, |
| Lupinus Nutkaensis, | Heracleum lanatum, |
| Valeriana Sitchensis, | Cassiope tetragona,[1] |
| Poterium Sitchense, | Fatsia horrida. |
| Ledum latifolium, | |

An universal scarcity of soil characterizes the whole surface of these parts of Alaska; and to this circumstance I attribute that practice of cremation which was universal among the natives until within the last twenty-five years, and which is still in use among the Hoonahs and other coast tribes to the north. The only exceptions to this method of disposal were made in the case of the Sheh-shoohs (shamans or sorcerers), whose bodies, together with the paraphernalia of their profession, were generally buried, but sometimes placed in inaccessible clefts or other spots in the steep rocky bluffs, where they would be safe from the visits of the prowling wolves.

The bodies of the common people were usually burned on the beach, no attention being paid to the ashes, while the remains of the Tyees (chiefs) were cremated either on the beach or near the village and the ashes gathered up and placed in a cavity made for this purpose in the back of the totem poles, such as still adorn the vicinity of all their old villages.

Having frequently referred to the use of ulikon oil (Eulachon or Candle-fish—Thaleichthys pacificus) in conjunction

[1] The dried plant exhales a delicate fragrance which lasts for years.

with many of their vegetable foods by the natives, a description of the native method of its preparation from this very oily fish may not be out of place here. The fish, which enter the larger streams in enormous numbers during the spawning season, are usually caught in small drag-seines and piled in a heap and allowed to remain for about two weeks, more or less, as the temperature of the season may require, until putrefaction has begun. They are then put into a wooden tank about 6 feet long, 3 feet wide, and $2\frac{1}{2}$ feet deep and heated thoroughly for a whole day by having hot stones placed upon them three or four times during the day. Next day a piece of lattice-work made of cedar sticks is pressed down upon them and the expressed oil is scooped off with a wooden canoe-bailer. The residue is then taken out of the tank, placed in buckets, and the remaining oil pressed out. The oil is then put into the native oil crates or boxes made of spruce or cypress, though empty lard-pails or coal-oil cans are now frequently used for this purpose. This oil solidifies at a much higher temperature than does seal oil, and consequently is much more portable in summer. It is more nutritious and more digestible than the latter and is more highly relished by the natives. Owing to the uncleanly method of preparation, one conceives a prejudice against it, though the taste of it is not worse than that of lard, and the natives much prefer it to the latter. It is not used for illuminating purposes by them, as is seal oil. The fish run in all the larger streams from the Skeena to the Chilkat and possibly farther north, and are eaten both salted and smoked by whites as well as natives.

## New or Noteworthy Species.—XVI.

Thysanocarpus hirtellus. A foot or two in height, loosely branched from the base, all parts except the inflorescence and fruit clothed rather densely with short and rather stiffly hirsute simple hairs: lowest leaves oblanceolate, coarsely toothed; cauline triangular-lanceolate, entire, with rather ample sagittate-clasping basal lobes: flowers very minute, the narrowly spatulate petals barely equalling the sepals; stamens longer and well exserted: pods round-obovoid, glabrous, venulose, the wing with 8 or 10 acutely ovate perforations, or with as many nearly closed sinuses instead (the dilated tips of the rays in this case distinct).

Discovered by the writer in a wooded cañon tributary to Dry Creek, Napa Co., California, 12 May, 1895. Very distinct from all known species by habit and pubescence; the pods also much more like those of the glabrous glaucous species *T. crenatus* and *conchuliferus* of the south than those of *T. curvipes* and other northern pubescent species.

Thysanocarpus emarginatus. Slender and low, much branched from the base, glaucous and also hispidulous, with scattered, spreading or deflexed white bristly hairs: cauline leaves all linear-lanceolate, entire, sessile but in no degree auricled or even dilated at base: flowers and radical leaves unknown: pedicels of fruit short, spreading, scarcely curved: fruit nearly orbicular, the body glabrous, with strong midvein and almost equally prominent transverse veinlets, the broad wing perfectly entire, scarious, abruptly and rather deeply emarginate at apex, wholly destitute of perforations and lacking even the usual radiating bundles of fibrous tissue.

Collected by the writer at the summit of Mt. Diablo, Calif., 20 June, 1892, and very erroneously referred, at the time, to *T. lacinatus;* from which it is distinguished not so definitely by its pubesence as by the remarkable character of the pods. In the structure of the wing of the fruit this species is equally removed from the group of the original species and from *T. radians;* but it has an ally in *T. Palmeri* of the far-distant Cedros Island.

THYSANOCARPUS AMPLECTENS. Stem stoutish, simple and leafy below, with a few racemose branches at the middle, 12 to 20 inches high, glabrous throughout and very glaucous: lowest leaves unknown; cauline linear-lanceolate, remotely and retrorsely dentate, with very conspicuous sagittate lobes at base which clasp the stem: white petals shorter than the purple (white-margined) sepals; stamens scarcely exserted: pod nearly orbicular, glabrous, the body reticulate-venulose, the wing of 14 to 16 short rays and a regularly crenate hyaline margin, but no perforations.

Type collected by the writer in southwestern New Mexico, 16 April, 1880; referred by Asa Gray at the time to *T. elegans*, from which species its perfectly glabrous and strongly glaucous herbage effectually excludes it. It is really of the group to which *T. lacinatus* belongs, though its very conspicuously sagittate-clasping and merely dentate leaves, as well as its mode of growth, prevent its being confused with that species. I do not know how much of the *Thysanocarpus* materials from Arizona now extant in herbaria may be referable to this very distinct extra-Californian member of the genus.

VIOLA LANGLOISII. Acaulescent and low, the subterranean caudex usually simple and erect: leaves of rather firm texture and somewhat conspicuously veiny, from reniform-cordate (in the earliest) to somewhat hastately deltoid, deltoid-ovate and ovate-cordate (in the later and larger), acute

or acuminate, scarcely cucullate, crenate-toothed and also minutely ciliolate on the margin, otherwise glabrous; the blade 1 or 2 inches long, the petioles not much longer: peduncles far surpassing the leaves, and bracteolate much below the middle: petals large, apparently light blue, glabrous, or the two lateral ones with a mere trace of the usual tuft of hairs.

Borders of moist woods in southwestern Louisiana, Rev. Fr. Langlois. Related to the northern *V. obliqua* much as *V. villosa* to *palmata*.

CHRYSOPSIS CAMPORUM. Erect, equably leafy up to the terminal cluster of rather long-peduncled large heads: leaves lanceolate, acute, remotely but distinctly serrate-toothed, sessile, sparsely and strigosely pubescent with short hairs, the margins near the base ciliate with a few short stout setaceous white bristles: lanceolate bracts of the broadly campanulate involucre almost wholly herbaceous, soft-pubescent, the hairs appressed: rays numerous, broad and showy.

A most distinct prairie species, of apparently limited range in the middle Mississippi Valley, in southern Illinois and perhaps adjacent Missouri, also extending thence southeastward; apparently first collected by Short, and confused with *C. villosa*.

SENECIO LÆTIFLORUS. Perennial, tufted but not proliferous at base, the stems strictly erect, 10 to 18 inches high, rather loosely cymose-corymbose at summit: leaves mostly radical, somewhat fleshy, light green, glabrous except a very distinct arachnoid white tomentum on the margins of the dilated bases of the long slender petioles, the blade of such leaves from spatulate-obovate and oval to round ovate, mostly crenate or serrate-toothed, rarely entire; cauline leaves few, sessile and pinnatified, often lyrately so: involucres campanulate, 4 or 5 lines high and nearly as broad; bracts lanceolate, acuminate, fleshy and carinate; rays showy,

of a very light yellow; achenes chestnut-brown, strongly 5-angled and with as many alternating less prominent ribs; pappus very copious, soft and deciduous.

Common in grassy wet meadows along the eastern base of the Sierra Nevada, Calif. The type specimens collected by myself, in July last, near Boca.

SENECIO RUBRICAULIS. Seldom a foot high, glabrous, glaucescent, somewhat fleshy, the stems and sterile leafy shoots from a branching subligneous caudex, the petioles and lower parts of stems of a rich red-purple: leaves obovoid, coarsely and more or less crenately toothed, about an inch long, tapering to the long slender petioles: heads in a close terminal corymb: bracts of the campanulate involucre oblong-lanceolate, abruptly acuminate, the midvein evident but scarcely carinate: rays few, golden-yellow: achenes light-colored, abruptly narrowed at summit, the 10 slender ribs subequal, the slightly more prominent 5 scarcely to be called angles.

Foothills of the Clover Mountains, Nevada, 1893; found by the writer in dry rocky and rather barren ground.

SENECIO LEMBERTI. Perennial, the tufted stems leafy below, erect, 1 or 2 feet high; herbage glabrous throughout and the leaves of a thin-membranaceous texture, the radical from round-ovate and crenate to spatulate-obovate and coarsely dentate, 4 to 8 inches long including the slender petiole; cauline reduced in number and in size, deeply and somewhat lyrately pinnatifid, with a broad and clasping base: heads 6 or 8, in a terminal rather condensed umbel; involucre 4 lines high, broadly cylindrical, bracts about twenty, lanceolate, thin, purple-tipped: flowers saffron-color, ligules wanting.

Species of the higher Sierra Nevada, Calif., and rare. Specimens are in hand obtained by Mr. Harford on Mt. Conness in 1890, and others from above the Yosemite Valley collected by Mr. J. B. Lembert in 1893.

SENECIO SCORZONELLA. Perennial from stout horizontal or ascending and apparently branched rootstocks: herbage rather sparsely flocculent, or somewhat arachnoid throughout, perhaps glabrate in age: leaves in a radical tuft, suberect, 5 or 6 inches long, broadly oblanceolate, somewhat spatulately tapering to a narrow scarcely petiolate base, the margin coarsely, irregularly and retrorsely lacerate-toothed in the broad upper portion, the tapering lower part entire: scapiform stem 12 to 18 inches high, bearing 2 or 3 small entire leafy bracts: heads 20 or more, in a somewhat paniculate terminal corymb, of the size of those of *A. aronicoides* and radiate; involucral bracts 10 to 14, obtusish, the involucre subtended by two or three separate and somewhat remote more foliaceous ones: ovaries glabrous, the mature fruit not known.

Plant of northeastern California, sparingly collected by Mrs. Austin, whose earlier immature and less satisfactory specimens were provisionally referred by Gray to *S. aronicoides*.

ERECHTITES POLYPODIOIDES. *Senecio gracilipes*, R. & G., Am. Journ. Sci. 3 ser. l. 156.—This beautiful plant of Mr. Pringle's Mexican collection of 1894 is hardly a *Senecio*; though were it of that genus it would need to be called *Senecio polypodioides*, on account of the established *S. gracilipes* of Peru, so named long ago by Asa Gray.

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# PITTONIA.

## A Series of Botanical Papers

BY

EDWARD L. GREENE,

*Professor of Botany in the Catholic University of America.*

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## New or Noteworthy Species.—XVII.

Ranunculus inamœnus. Green and appearing as if glabrous, but sparsely hairy, the stoutish stems 6 to 12 inches high: radical short-petiolate leaves obovate-flabelliform, at summit either crenate-toothed or 3-lobed, the cauline usually quite sessile and once or twice ternately divided into oblanceolate segments: peduncles short and slender, often 3 to 5 together and subumbellate: corolla 3 to 5 lines broad, the 5 petals obovate-oblong: head of small pubescent achenes ovoid or short-cylindraceous, the linear receptacle white-hispid.

Common in the whole Rocky Mountain region, at middle elevations, and hitherto erroneously treated as a variety of the arctic *R. affinis*.

Ranunculus Gormani. Small and slender perennial, with a fascicle of thick but long and slenderly tapering fleshy-fibrous roots: leaves on almost filiform petioles 1 to 3 inches long, the lamina broadly ovate, or deltoid-ovate, acute, coarsely few-toothed, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, only the petioles somewhat pilose-hairy: stems several, simple, prostrate at base, rooting and bearing leaves at 2 or 3 nodes, the terminal part naked, ascending and scapiform, bearing a solitary small flower: sepals spreading: petals 5, oblong, obtuse, twice the length of the sepals: achenes small, glabrous, moderately compressed, with a slender curved beak as long as the body.

On moist banks at Cathedral Springs, Crater Lake, in southern Oregon, 22 Aug., 1896, collected by Mr. M. W. Gorman. A neat and very well marked new Ranunculus,

altogether resembling a small Ficaria. I gladly dedicate the species to the discoverer, who has already done excellent service to the systematic and economic botany of the remote Northwest.

RANUNCULUS ELLIPTICUS, Greene, Pitt. ii. 110. In the *Flora Franciscana*, on account of an apparent blending of this species with *R. glaberrimus* on the eastern borders of California, I reduced it to the rank of a variety. But this was not wisely done. Mr. Sonne, whose specimens seemed to show close intergrading between the two, has more recently detected a character by which *R. ellipticus* is clearly in all its forms distinct. Its peduncles are *recurved after flowering*. This, in addition to the other characters which I was obliged to concede to it, even as a variety of *R. glaberrimus*, are abundantly sufficient to sustain it in the rank of a species. And that this Rocky Mountain type was long ago about to be received by Asa Gray as a new species, I find evinced in a letter which he wrote me twenty-six years since; a suggestion, of which I had retained no recollection at the time of my publishing the species. I had sent him this plant from Colorado, in 1870, under the name of *R. glaberrimus;* and he replies: "What I so called in [the enumeration of] Parry, etc. There is something about it to be said hereafter. I want it in fruit!" Any one familiar with Dr. Gray as a correspondent will recognize this as his method, intimating that a probable new species is in hand. But he afterwards committed the error of referring this plant to what he called *R. alismæfolius;* and it was actually sent from Cambridge to Kew as representing the plant now known as *R. alismellus!* The ticket there is in the handwriting of the late Mr. Sereno Watson.

DELPHINIUM NELSONII. Obscurely puberulent; erect, slender and simple, 1 to 1½ feet high, from a dense cluster of thick tuberiform roots, these not deep-seated but very near the surface of the ground: leaves few, the lowest long-

petioled, the petioles abruptly dilated at base and quite sheathing the stem, the blade divided and subdivided into linear-oblong segments, or the upper cauline simply divided into 5 to 7 long linear segments: raceme long and loose: flowers sparsely villous externally; sepals rather narrowly and spatulately oblong; quite surpassed by the rather slender slightly curved spur; limb of the bifid lower petal rounded in outline, villous-ciliate and with a dense tuft of white hairs in the middle, otherwise glabrous: follicles appressed-pubescent, gradually divergent from near the base: seeds wing-angled above, the wings around the summit of the seed confluent into a saucer-shaped concavity.

Common in the Rocky Mountain region of middle Colorado and southern Wyoming; hitherto confused with the extremely different *D. bicolor*, Nutt. Probably all which Mr. Nelson has collected, and called "*D. bicolor*" in his recently published list of the plants of Wyoming must be referred to this. The *bicolor* of Gray is still no doubt an aggregate, even with this taken out; but further segregation cannot well be made so long as the roots and seeds of several of the forms of farther northwestern districts are neglected by collectors.

DELPHINIUM DIVERSIFOLIUM. Stem solitary, slender, 1 to 2 feet high, from a grumous root: lowest leaves semiorbicular, or at least with an extremely broad and open sinus, the 5 primary divisions cut into oblong obtuse callous-mucronate lobes, the whole perfectly glabrous and somewhat fleshy; middle cauline leaves flabelliform, larger than the lowest, deeply cut into entire or tridentate segments: slender raceme on a long naked peduncle, 6–15-flowered, the rachis and pedicels puberulent: sepals oblong, rather small, much exceeded by the long slender straight ascending sparsely villous spur: follicles erect, slender, appressed-pubescent: seeds smooth, but with prominent thickish and turgid scarious angles.

Frequent in subalpine moist meadows among the mountains about the headwaters of the Humboldt River in eastern Nevada. A graceful subscapose species, quite recalling the Californian *D. uliginosum* both in aspect, and its swampy habitat, yet in no degree related to that species. In all probability it is the *D. depauperatum* of the Botany of Clarence King's Expedition, for it seems to be the only *Delphinium* of the region referred to; but the author, or authors, of that volume did not describe their plant, but only repeated Nuttall's character of his *D. depauperatum*, to which this is far enough from answering.

DELPHINIUM HANSENI. *D. hesperium* var. *Hanseni*. Greene, Fl. Fr. 304. To the character ascribed in the place cited must be added: seeds white and bur-like by a dense coat of prominent flattened and somewhat scale-like processes: racemes in the type short and dense: spur of the calyx rather long, only slightly curved. Nearly allied to this, and confused with it in the *Flora Franciscana*, is a variety or subspecies which may take the name ARCUATUM, and be differentiated as follows: spiciform raceme long and loose: sepals much broader; spur short, strongly curved: radical leaves, and especially the petioles, hispid-hirsute: seeds as in true *D. Hanseni*. The discovery of the marked peculiarity of the seeds, on account of which the plant must needs be separated from *D. hesperium* altogether, is due to Miss Eastwood, who was first to obtain the species in fruit.

DELPHINIUM COGNATUM, Greene, of page 14 preceding, is probably the plant which should stand for the type of Dr. Gray's *D. Andersonii*, which species is certainly a mixture of the grumose-rooted *D. decorum* var. *Nevadense*, Wats., and the fibrous-rooted species of the Nevada deserts. Since the author credits his species with fibrous-roots, we must, of course, take as typical the one which answers to that part of the description. In the *Flora Franciscana* I very inexcus-

ably accepted as typical of *Andersonii* the grumose-rooted plant of the Sierra Nevada, which Gray had confounded with it, and named as a part of it.

SOPHIA SONNEI. *Sisymbrium incisum* var. *Sonnei*, Robinson, in Gray, Syn. Fl. i. 140. From the typical SOPHIA INCISA (*Sisymbrium incisum*, Engelm.) this plant of the eastern borders of California appears constantly to differ in more important particulars than those of its leaf character. Its short and very few-seeded pods are remarkably and quite characteristically acute; and the valves are both extraordinarily firm in texture and almost reticulately venulose. It grows in company with S. HARTWEGIANA (*Sisymbrium Hartwegianum*, Fourn.) with no apparent intergrading between the two.

The adoption of this type of plants as a distinct genus by recent authors must be eminently satisfactory to all students of the Cruciferæ who study them in the field as well as in the herbarium, thereby becoming convinced as it were by nature herself, that differences of habit are of prime importance in distinguishing genera. But the name *Descurainea* taken up in the Engler & Prantl series of monographs was not well selected. It is long antedated by *Descuria*, while SOPHIA is much older than either.

NEOBECKIA AQUATICA. *Cochlearia aquatica*, Eaton, Man. 5 ed. 181 (1829). *Nasturtium natans* var. *Americanum*, Gray, Ann. Lyc. N. Y. iii. 223 (1836). *Nasturtium lacustre*, Gray, Gen. Ill. i. 132 (1848). *Roripa Americana*, Britton, Mem. Torr. Club. v. 169 (1894). Not many genera in the intricate family of the Cruciferæ are more satisfactory than *Roripa*, if it be duly restricted according to what is indicated in nature. I have, in the *Bay Region Manual*, shown its essential character, and have excluded, as seemed indispensably necessary, the water-cress and horse-radish types, pointing out their characters. And the above eastern type is even

more distinct from the natural genus *Roripa;* nor do I see how, with its long subclavate styles and thin partitionless pods, it can be made out congeneric with even *Armoracia*, to which it is related. As a perfectly acceptable genus—monotypic, unless certain North Asiatic species prove congeneric—I have named it in honor of a long neglected but most deserving name in American botany, that of Dr. Lewis C. Beck.

Roripa tenerrima, Greene, Eryth. iii. 46. To the original account of this species the following is now to be added: growing parts, especially of the inflorescence and even to the half-grown ovaries, minutely scabrous: flowers altogether green—not at all yellow—the minute pale petals much shorter than the green sepals and nearly concealed by them.

Having myself detected last summer, in western Nevada, a plant which upon comparison proves identical with the type collected by Mrs. Austin, I have been able to identify with the species many sheets long kept in my herbarium under other names. The typical form, as found by myself, inhabits stream banks deeply shaded, and is more slender than most of the specimens; but the plant as found in open ground is always slender, diffusely branching and depressed, and the minute roughening of the growing parts is here more obvious. The species is common along the lower Humboldt and Truckee rivers in western Nevada and eastern California. A form of it, with shorter pods—these ovate or ovate-lanceolate in outline—is in my herbarium from Mr. Suksdorf, as obtained by him on "sandy bottom lands near Bingen" in Washington, 1894. It appears to have been named as *Nasturtium obtusum* by him, as it also was by Mr. Canby, who distributed it from the banks of the Yellowstone in 1882.

Roripa trachycarpa. *Nasturtium trachycarpum*, Gray, Bull. U. S. Geol. Surv. ii. 233. This plant of the valley of

the Mississippi seems clearly distinct from that Rocky Mountain and Pacific American type which is the original of Nuttall's *Nasturtium sinuatum*.

RORIPA CURVIPES. Low, slender, diffusely branched, the branches in maturity ending in several elongated racemes which are unilateral by the decurved pedicels of the very small pods: herbage nearly glabrous: leaves from lyrate-pinnatifid to ovate-lanceolate and merely dentate: flowers minute, yellow in all parts, the petals slightly surpassing the sepals; stamens not exserted: pods ovate-acuminate or ovate-falcate, scarcely 2 lines long, tipped by a short style, few-seeded, often torulose by one or more manifest constrictions.

Rather frequent in the mountains of southern Colorado, at middle elevations, occurring along streamlets chiefly. An excellent species by the marked character of the pods, and their arrangement in long one-sided racemes.

RORIPA MULTICAULIS. Slender and glabrous, the herbage dark-green or purplish: stems very numerous, ascending or more depressed and forming a low bushy mass $1\frac{1}{2}$ or 2 feet broad: lowest leaves pinnately parted and the oblong-lanceolate segments dentate, the upper lanceolate and coarsely dentate: flowers minute, yellow: pods linear, straight, abruptly acute, 4 or 5 lines long, suberect on very short pedicels, usually of a dull dark purple, slightly obcompressed: seeds minute, the reticulation of the testa extremely minute.

Common on moist banks of the San Joaquin River, thence southward perhaps to Lower California. On account of the somewhat obcompressed siliques I long ago placed this as a variety of the N. Californian R. OCCIDENTALIS (*Nasturtium occidentale*, Greene), notwithstanding its several marked peculiarities of aspect; but even the pods, as well as the mode of growth, are different, and there is a very strong

contrast between the two in the character of the seeds; the testa in those of *R. occidentalis* being somewhat coarsely and favosely reticulate.

BERBERIS NANA. Stems very short, mostly simple, usually 2 or 3 inches, seldom 6, in height, but numerous and clustered from creeping and branching woody rootstocks: leaves long-petioled, the leaflets (in about 3 pairs) oblong-ovate, acute, spinulose-serrate, sessile by a broad inequilateral base, dull-green and glaucescent on both sides: racemes several, terminal (apparently) at flowering, but in fruit lateral: berries small, subglobose, blue.

Plentiful in exposed stony or rocky ground throughout the Rocky Mountain region, from Idaho and Montana to New Mexico and Arizona; long mistaken for *B. repens*, Lindl., and being certainly the plant to which the name *repens*, as far as that goes, is most applicable. But it is equally certain that the present plant is far from that of Lindley, whose plate in the *Botanical Register*, and also the description, represent a stoutish erect branching shrub, not unlike *B. Aquifolium* in size and habit, but differing in form, texture, and blue-green hue of the leaflets; also supposed to diverge from that species in its mode of propagating itself by creeping offshoots. But *B. Aquifolium*, as I have seen it in its native soil, does the same. Quite such a shrub as Lindley describes for *B. repens* is still in cultivation at the East; and there are traces of it in the herbaria, such specimens coming from Idaho and adjacent districts; and these make an approach to *B. pumila* of California and southern Oregon in several particulars.

CRATÆGUS SALIGNA. Slender tree 10 to 18 feet high, with rather few branches and long willowy more or less drooping branchlets: leaves firm, glabrous, those of sterile branches rhombic-lanceolate, acuminate at both ends, crenate-toothed in the middle, about 2 inches long including the very short petiole, those of the fruiting twigs oblong-ovate, mostly obtuse, rather evenly crenulate except near the base; stipules lunate; thorns few, slender, very slightly curved: fruits in rather ample corymbs, small, black but distinctly glaucous, the pulp greenish, dry, mealy and insipid.

Plentiful along the lower Cimarron River, Colorado, in ripe fruit 30 Aug., 1896. Allied to *C. rivularis*, but strikingly distinct in habit as well as foliage.

MENTZELIA DENSA. Perennial, low, compactly branched from the base, seldom a foot high, the whole plant forming an almost hemispherical tuft; the numerous white and hispid branches and branchlets short-jointed and flexuous: leaves small, sinuate-pinnatifid, very hispid: flowers solitary or in threes at the ends of the branchlets, golden-yellow, about $1\frac{1}{2}$ inches broad; the 10 to 15 petals subequal, spatulate-lanceolate, acute: mature capsule oblong, striate, the linear-subulate teeth about half the length of the body: seeds round-ovoid, thin and flat, strongly winged.

Common in the Cañon of the Arkansas in southern Colorado, and elsewhere among the foothills; apparently referred to *M. multiflora* by some, though that is a biennial of altogether different mode of growth, and with larger straw-colored flowers.

MENTZELIA LUTEA. Stoutish biennial 2 or 3 feet high, narrowly and almost thyrsoidly paniculate from below the middle; plants of the first season with a very long slender-fusiform fleshy root, and a dense tuft of sinuate-pinnatifid succulent leaves: cauline leaves large, sinuate-dentate:

flowers small, of a deep rather greenish yellow ; petals acute, the blade elliptical, the claw short and ligulate, the 5 inner ones about three-fourths as long as the 5 outer ; style exserted beyond the numerous stamens: capsule thick-walled, not striate: seeds oval, flattened, yet irregularly angular on the face, encircled by a narrow thin margin.

In wet strongly alkaline soil near Cañon City, Colorado, 7 Sept., 1896. A very peculiar species, in view of the greenish hue of the flowers, and the scarcely definable character of the seeds.

COLEOSANTHUS SCABER. Allied to *C. microphyllus*, but neither villous nor viscid, merely scabrous-puberulent and slightly glandular: slender woody branches leafy below, racemose from below the middle: leaves broadly ovate, coarsely toothed, deflexed on the very short petioles, the largest $\frac{1}{2}$ inch long, those of the monocephalous (or rarely tricephalous) peduncles greatly reduced ; bracts of the involucre obtuse or acutish ; flowers about 10 or 12 to the head: achenes serrulate-scabrous on the angles.

Mountains near Grand Junction, Colorado, 27 August, 1896. In addition to my own specimens I have seen one rather poor one in the herbarium of the Smithsonian Institution, this from the Mesa Verde, in southeastern Colorado, collected by Miss Eastwood. It was referred to *C. microphyllus*. I also suspect, from the account given of "*B. microphylla*" in the *Synoptical Flora*, that Dr. Gray had the present plant, and that his attempted description of Nuttall's Oregonian species is modified and extended to cover this entirely too dissimilar one.

SOLIDAGO TRINERVATA. Stems decumbent and ascending, from branching and widely spreading horizontal rootstocks: herbage cinereous-scabrous: leaves widely spreading on the stems, linear-lanceolate, entire, very acute, many of them distinctly triple-nerved, mostly 2 or 3 inches long: panicle

of unilateral racemes rather lax: bracts of the involucre in few series and acutish, glabrous and conspicuously green-tipped: achenes hispidulous.

Species common along the foothills of the mountains in southern and western Colorado; doubtless confused with *S. nemoralis* by Gray, in spite of its excellent character of trinervate acute entire leaves, and peculiar habit. It grows mostly in large colonies, by its rambling rootstocks, never singly or a few stems together, as is always true of *S. nemoralis, nana* and *Californica.*

SOLIDAGO FASCICULATA. Stoutish, erect, 1 or 2 feet high, pale and scabrous-puberulent: leaves small (1 to 2 inches long) of firm texture, oblanceolate, entire or with a few serratures, the axils of the middle and upper cauline all bearing very short densely leafy sterile branchlets: panicle of secund-racemiform branches, large for the plant, rather compact: heads about 2 lines high; bracts of involucre ovoid and oblong-linear, obtuse, nearly or quite glabrous, scarcely ciliolate even at the tips: achenes appressed-pubescent.

Sapulpa, Indian Territory, 27 Sept., 1895, B. F. Bush; distributed for *S. nemoralis*, but in every way more like *S. radula*, except that the herbage is almost cinereous-scabrous.

CHRYSOPSIS FLORIBUNDA. Tufted stems slender and diffuse, all paniculately branched from the base and bearing numerous small heads: herbage rather densely pellucid-glandular, and sparingly hispid, especially on the leaf-margins and bracts of the involucre: leaves little more than ½ half inch long, spatulate-obovate, entire, obtuse, mucronate: bracts of the small involucres few, in about 3 series: rays few but broad and showy: achenes appressed-silky; paleaceous outer pappus very distinct.

In deep cañons of the Gunnison River, near Cimarron, Colorado, 27 Aug., 1896. A small but showy species, very slender, and remarkably profuse in its flowering.

GRINDELIA DECUMBENS. Stems several, a foot high or more, decumbent at base, encircling a tuft of radical leaves, the root perennial: radical leaves thinnish, oblanceolate, obtuse, 3 to 5-toothed at summit, below tapering very gradually to the narrowly winged petiole, this again gradually dilated at base: cauline leaves few and small, oblong, acute, entire: heads many, rather small, in a corymbose panicle: bracts of the subglobose involucre rather few, only the outermost short ones conspicuously squarrose: rays ample but few and remote, only about 10 or 12 to the head: ray-achenes trigonous, those of the disk thin and flat, striate; the 2 or 3 pappus-awns stout, flat, barbellate above.

Common on low slopes of the mountains about Cimarron, Colorado, 30 Aug., 1896.

GRINDELIA FASTIGIATA. Stems erect, slender, 2 or 3 feet high, at summit narrowly and racemosely or more freely and fastigiately branching; the root perennial: radical leaves narrowly lanceolate, acute, remotely serrate; cauline of the same form but small, occasionally entire: heads small, nearly spherical, rayless; the short pedicels clothed with crowded squarrose bracts confluent with the similar outermost involucral ones; inner bracts elongated, not squarrose-tipped: outer achenes trigonous and turgid, the inner flat and strongly striate; pappus-awns 2 or 3.

Banks of the Grand River at Grand Junction, Colorado, 27 Aug., 1896.

GRINDELIA INORNATA. Stout and low, the several stems decumbent, the root perennial: both the short-petioled radical and broad-based sessile cauline leaves of oval or obovoid outline and saliently serrate-toothed all around, obtuse at apex: corymbose-panicled heads large, hemispherical, rayless: bracts of the involucre numerous, all squarrose: outer achenes only somewhat thicker than the thin inner ones, all truncate at summit, only very finely striate: pappus-awns 2, barbellate below the very acute apex.

Very frequent in southern Colorado, at Cañon City, etc.; evidently forming a part of Gray's *G. squarrosa*, var. *nuda*, though not at all the *G. nuda* of Wood. It is most certainly distinct from *G. squarrosa* not so much by its discoid heads as by its perennial root. Not only this but also both the preceding new species have a persistent tap root surmounted by a central tuft of radical leaves, around which tuft the stems of each succeeding year are produced. *G. squarrosa*, as I have noted during many seasons, is always strictly biennial, the stem erect and terminal to the root-axis, the radical leaves dying as the plant approaches maturity, quite as in all biennials. Herbarium specimens usually fail to show these things, hence much confusion in the herbaria and in books.

ASTER OXYPHYLLUS. Rigidly erect, 1 to 2 feet high, from horizontal branched rootstocks, leafy up to the ample often corymbose panicle, nearly glabrous: leaves all lanceolate and linear-lanceolate, entire, acute, scabrous on the margins, the cauline sessile by a broad half-clasping base, the radical with short narrowly winged and ciliate petioles: the rigid ascending branches and branchlets of the panicle sparsely pubescent and subulate-bracted: involucres $\frac{1}{4}$ inch high, much imbricated, the outer bracts green almost throughout, the inner with green tips, all densely ciliolate: rays about 25 or 30, blue: achenes pubescent.

On clayey banks and bottoms of the Grand River, at Grand Junction, Colorado, 26 Aug., 1896.

ARNICA SPATHULATA. A foot high or more, stoutish, somewhat viscidly hirsute and tomentulose, very leafy below, and floriferous from about midway of the stem: lowest leaves 3 to 5 inches long, broadly lanceolate-spatulate, doubly toothed, the two or more pairs of lower cauline more narrowly spatulate but dilated just above the insertion: peduncles 6 to 10, the lowest with a pair of ovate-acuminate sessile bracts in the middle: heads campanulate, $\frac{3}{4}$ inch high; in-

volucre densely woolly-hirsute and viscidulous; rays none; disk-corollas ochróleucous, the tube hirsute, the teeth with a tuft of pilose hairs at tip: achenes glabrous, minutely resinous-dotted; pappus white, barbellulate-scabrous.

An Oregonian species, hitherto confused with *A. discoidea* which has cordate slender-petioled leaves, and hirsute or hispidulous achenes.

ARNICA SUBPLUMOSA. Two feet high, glandular-pubescent above, below glabrate, or roughish with short curved hairs: lower leaves lanceolate, acute, denticulate, tapering to a winged petiole; cauline gradually smaller, sessile: heads about 3, short-peduncled: disk-corollas narrow-funnelform, the tube glabrous or nearly so: achenes glabrous, or with a few short hairs, seldom with a few glandular dots; pappus short, fuscous, subplumose.

Subalpine woods of the Colorado Rocky Mountains. Has passed partly for *A. Chamissonis* and apparently partly for *A. longifolia;* but its sordid almost plumose pappus is a good specific character; its gradually diminishing cauline leaves is another; moreover, *A. Chamissonis* has a fine dense almost tomentose indument.

ARNICA SONNEI. Two feet high, leafy at base, the upper 2 or 3 pairs of leaves much reduced and remote; the lower and radical ones with broadly lanceolate evenly and saliently dentate blade 3 to 5 inches long, on a strongly villous-lanate petiole of 1 to 3 inches; herbage in the main loosely and scantily villous; heads 3 to 7, pedunculate: involucre campanulate, ½ inch high or more; the linear-lanceolate bracts loosely hirsute: rays (occasionally wanting) numerous, golden yellow: disk-corollas rather narrowly funnelform, the tube and throat pilose: achenes glabrous below, distinctly hirsute above the middle: pappus dull-white, barbellate.

Species of strougly marked habit and foliage, obtained by Mr. Sonne in the mountains of California above Truckee. It is most related to *A. Parryi.*

ARNICA DENUDATA. Stems solitary, from extensively creeping horizontal slender rootstocks, 2 to 3 ft. high, leafless below (at flowering time) and with greatly elongated internodes, the upper leafly and flowering portion green and only slightly viscid-puberulent even to the involucres: leaves in about 4 pairs, lanceolate, subentire; upper pairs broader and sessile, lower narrower and short-petioled, but at base connate-vaginate: heads 3 or 5, the lateral peduncles well surpassing the terminal one: disk-corollas slender-funnelform, the tube densely pubescent: achenes sharply angular, and hispid on the angles; pappus dull-white, barbellate.

In wet meadows of the Humboldt River, near Deeth, Nevada, 14 July, 1896.

In a var. CANESCENS, growing with the type, and confluent with it, the whole herbage is canescently tomentatose, and the leaves are broader and dentate.

SENECIO ACCEDENS. Stems several from the root, about 2 feet high, leafy below, somewhat corymbosely panicled above, with rather few and large nodding heads: leaves narrowly lanceolate, acute, denticulate, on long and slender petioles which are much dilated below, the whole herbage sparsely flocculent when young, at flowering time glabrous or nearly so: heads about $\frac{3}{4}$ inch high; bracts of the narrow-campanulate involucre oblong-lanceolate, scarious-margined, the few calyculate ones ligulate; rays none; ovaries glabrous.

In open woods at Marshall Pass, Colorado, 4 Sept., 1896; barely in flower at that date. Plant with the foliage of *S. cernuus* nearly, but of different mode of growth and inflorescence; the large nodding heads almost those of *S. Rusbyi*.

SENECIO ATRATUS. Stems several or many, closely tufted, decumbent at base, stoutish, a foot high or more, leafy up to the dense compound corymbiform cyme of small heads; herbage flocculently tomentose even in maturity: radical leaves 6 to 10 inches long, oblanceolate, acutish, dentate or

denticulate, those of the stem smaller and gradually diminished in size toward the inflorescence: bracts of the narrow involucre only 8 or 10, firm, oblong, obtuse, either wholly black or the inner ones with blackened midvein and tip; rays few or none; disk-corollas salmon-color: achenes greenish, glabrous; pappus firm, persistent.

Plentiful towards timber-line in the Rocky Mountains of Colorado, Utah, &c.; supposed by some to be a variety of the obscure far-northern *S. lugens*, and forming a part of *S. lugens* var. *foliosus* of Gray's *Synoptical Flora*.

SENECIO SPHÆROCEPHALUS. Stems several, stoutish, 2 or 3 feet high, nearly naked above, ending in a simple subumbellate cyme of broad heads, these after flowering closed and subglobose; herbage hoary-flocculent even in age: radical leaves with broadly oblanceolate acute denticulate blade and a long petiole, those of the stem scattered and small: bracts of the broad involucre 20 to 30, thin, linear, wholly green; rays conspicuous, pale yellow: achenes very small, dark brown, hispidulous on the angles with white hairs; pappus very fine, deciduous.

Common in wet meadows of the Humboldt River and elsewhere in the Great Basin, and, like the preceding, confused with *S. lugens*, but more closely allied to *S. Toluccanus* of Mexico and the southern Rocky Mountains.

SENECIO TRIGONOPHYLLUS. Glabrous perennial, with clustered upright very leafy stems 2 to 4 feet high: leaves membranaceous and deep-green, from hastate-ovate to deltoid and triangular-lanceolate, usually sinuate-toothed or denticulate, rarely more incisely and deeply toothed, the blade 2 to 4 inches long, the petiole an inch or less: heads small and numerous in an ample compound cyme: involucres campanulate, only 2 or 3 lines high, the bracts 10 or 12, oblong-linear, abruptly acute: achenes greenish, glabrous, linear, obscurely and obtusely angled; pappus very fine, deciduous.

Common along streams at 6,000 to 7,000 feet elevation in the Sierra Nevada of middle California, hitherto confused with *S. triangularis*, which is not in California, and is easily distinguished by its yellow-green somewhat fleshy herbage, coarsely toothed elongated leaves, and twice or thrice longer cylindraceous involucres arranged in a simple cyme; a species which abounds at the far north, but appears to extend southward only to Oregon on the Pacific coast, and is plentiful much farther southward in the Rocky Mountain system. *S. trigonophyllus* is more nearly related to the Oregonian *S. subvestitus*, Howell; but that is a conspicuously pubescent species.

CREPIS GRANDIFOLIA. Tomentulose throughout, the stout stems 1 to 3 from the root and 12 to 16 inches high, the several oblanceolate acuminate runcinate-toothed long-petioled radical leaves nearly as long as the stem, the 1 or 2 cauline reduced in size but not small: branches of the cymose panicle several, unequal, and, with the pedicels, somewhat glandular-hispidulous: heads 8 to 15, more than $\frac{1}{2}$ inch high, 12 to 18-flowered: achenes 3 or 4 lines long, dull-black, linear-fusiform, with ten prominent obtuse ribs.

Foothills of the mountains of eastern Nevada east of Wells, 15 July, 1896. Allied to *C. acuminata* and *occidentalis*, and remarkable for the length of its ample and rather numerous root-leaves.

CREPIS RUNCINATA, VAR. CILIOSA. Leaves as in the type, except that the longer and more conspicuously winged petioles are more or less strongly, sometimes tomentosely, ciliate: heads larger; achenes more elongated, rather distinctly tapering above.

Mountain meadows about the headwaters of the Humboldt River, Nevada, 15 July, 1896.

CREPIS SUBCARNOSA. Stout and low, more or less pubescent, slightly succulent, the scape about a foot high, bearing

at summit few and long-pedunculate heads: leaves of spatulate-oblanceolate outline, obtuse or acutish, saliently but not runcinately toothed: peduncles and involucres glandular-hispid: slender-fusiform achenes tapering; pappus fine and fragile.

Meadows along the Humboldt River at Deeth and elsewhere in eastern Nevada, thence northward to southern Idaho. Related to *C. runcinata* and *platyphylla.*

CREPIS LANCIFOLIA. Naked and scapiform stems and tufts of radical leaves several from a perennial root: herbage glabrous throughout even to the involucres: leaves 5 to 8 inches long, narrowly oblanceolate, attenuate-acute, entire, with narrow winged petioles: rather large and showy heads forming a somewhat close cymose terminal cluster: bracts of the involucre oblong-lanceolate, very thin and glabrous except at the very tip which is pubescent: achenes not known.

Moist meadows below Marshall Pass, Colorado, 4 Sept. 1896. Also of the group to which *C. runcinata* belongs, but with marked characters of leaf and involucre, and a peculiar mode of growth, the root being surmounted by a short branching caudex.

ALLOCARYA NITENS. Annual, prostrate, very diffusely branched, the slender branches a foot long or more, racemose and leafy or leafy-bracted almost throughout, the foliage and especially the calyx strigose-hispidulous; corolla minute: nutlets $\frac{3}{4}$ line long, ovate, acuminate, obtusely but prominently carinate ventrally down to the narrow supra-basal scar, the back wholly devoid of either rugosities or murication, but marked lengthwise by a low broad median elevation, the whole surface on all sides otherwise smooth and vitreous-shining.

Dry beds of spring pools in meadows of Pine Creek, Nevada, 20 July, 1896. A very strongly marked species by its smooth and polished nutlets.

ALLOCARYA LEPTOCLADA. Annual, prostrate, less diffusely branching than the last, the simple stoutish and somewhat wiry branches commonly more than 2 feet long, leafy at base, loosely floriferous throughout and without bracts: herbage apparently glabrous, but sparsely strigose-hairy under a lens: corollas rather large and showy for the genus: nutlets a line long, straight, lanceolate, the basal scar on a short-stipe, the ventral face carinate, the back muriculate and with a few sharp transverse ridges, these beset with short bristly hairs.

Habitat of the preceding. A species suggesting the Californian *A. stipitata* in the form of its nutlets, and *A. Nelsonii* (Eryth. iii. 48) in the bristly hairiness of the rugæ, otherwise very unlike either. It is by far the largest known species of the genus, a single plant often spreading over five feet of ground.

ALLOCARYA TENERA. Annual, erect, very slender, 3 to 6 inches high, leafy below and with few almost filiform naked racemose branches: herbage pubescent, not at all succulent: calyx very small, the linear segments spreading in fruit: corolla large for the plant: nutlets less than $\frac{1}{2}$ line long, scarcely compressed, slightly incurved, delicately granulate between the rather few thin and delicate transverse rugæ, the ventral face lightly carinate, the back not in the least so.

Adam's Springs, Lake Co., California, July, 1894, Mrs. Emily Booth.

OREOCARYA GLOMERATA (Nutt.), Greene, Pitt. i. 58. This specific type, excellently described by Nuttall originally under *Myosotis*,[1] has come to be very much confused in botanical collections with related but distinct species. Of this condition of things I have become increasingly well aware during the last ten years; and, since the nutlets do not differ strikingly in this aggregate, and since herbarium

[1] Nutt. Gen. i. 112.

specimens very usually fall far short of showing the full characteristics of the vegetative organs, I have deferred from year to year any attempt to segregate the forms; wishing first to use all possible diligence in the field-study of them; and their territory is vast. I have, by using the opportunities afforded by several more seasons of extensive travel, now satisfied myself of the perfect distinctness of those which follow. Nuttall's type is easily distinguished from all the rest by its broad and very obtuse or even retuse radical leaves, its small stature, and simple stem. Its rather elongated and straight nutlets are beset on the back by short and distinct transverse bars, with many intervening tuberculations. Hooker's figure of *Myosotis glomerata* does not represent Nuttall's type, but another species, while his description is evidently drawn from an aggregate of several.

OREOCARYA AFFINIS. Biennial, about a foot high, with the main stem erect, stout, well surpassing the several more slender ascending ones arising from around its base: radical leaves obovate-lanceolate, obtuse, canescent with a subtomentose indument intermixed with long and appressed bristly hairs having a conspicuously pustulate base, the lower cauline twice or thrice larger, green, and, with the stems and inflorescence, hispid: the short axillary forked racemes an inch long or more, forming a subcylindric thyrsus for two-thirds the length of the stem: corolla-tube about equalling the calyx: elongated and somewhat acuminate nutlets covered on the back with low subconic tubercles, or these occasionally somewhat confluent into transverse ridges, a more minute tuberculation or granulation apparent only near the margin.

Sandy hills near Red Buttes, Wyoming, 5 July, 1896. The figure in Hooker's Flora (of *Myosotis glomerata*) seems to represent a narrower-leaved form of this, in all save the character of the nutlets.

OREOCARYA THYRSIFLORA. Biennial, erect but seldom simple, the crown of the root usually producing 3 or more equal stout stems a foot high, these leafy toward the base and rather amply thyrsoid-panicled from below the middle: leaves all oblanceolate, obtuse, strigose-hispid: branches of the inflorescence forked, and with a flower in the fork: calyx hispid and hirsutulous, the segments narrow, not elongated: corolla-tube not exserted, very short: nutlets only 1½ lines long, ovate, obtuse, acutely-margined, dorsally rather sharply but interruptedly rugose.

Very common on stony hills in southern Wyoming about Cheyenne, Laramie, &c., thence to middle Colorado.

OREOCARYA INTERRUPTA. Perennial, tufted, 1½ to 3 feet high, canescently tomentulose throughout, the stems and stem-leaves, also the calyx, hispidly hirsute: radical leaves oblanceolate, acute, tapering to a broad hispid-ciliate petiole: stem leafy below, above the middle interruptedly floriferous, the inflorescence uninterrupted and thyrsiform only at summit: calyx elongated, the segments 4 or 5 lines long: corolla smaller than in allied species: nutlets elongated-ovoid, obtuse, dorsally marked by a distinct but little raised median ridge and many low tuberculations seldom approximating the transversely rugose.

This I have not seen in any herbarium; but it was collected by myself in the mountains of eastern Nevada, in July last. It abounds in open woods some miles east of Wells.

OREOCARYA FULVOCANESCENS (Gray), Greene, Pitt. i. 58. The type is Fendler's 632, from the mountains of New Mexico. It has a densely silky-tomentose herbage, only the inflorescence displaying a yellow hispid hairiness; the leaves are linear-spatulate and acute. With this type the plant of Nevada and eastern California, called *Eritrichium fulvocanescens*, Gray, is not to be confounded. That may be named and characterized as follows:

OREOCARYA HUMILIS. *Eritrichium glomeratum*, var. *humile*, Gray, in part. Perennial, cespitose, 6 to 10 inches high, strigosely hirsute and hispid, with some tomentose pubescence on the lowest leaves, these obovate, obtuse, tapering spatulately to a long slender petiole: flowering stems rather slender, equably floriferous from near the base to the summit, the flowers solitary or few in the axils of leaves and bracts, the whole forming a narrow spiciform thyrsus: corolla-tube scarcely exceeding the long calyx, the hairs of the latter not yellow: nutlets ovate, abruptly narrowed at summit, with an indistinct dorsal ridge, rather densely tuberculate but not rugose.

Frequent in the mountains of Nevada and adjacent eastern California; the Californian plant, as collected by Mr. Sonne, having nutlets nearly twice as large as in the more typical form of eastern Nevada, yet otherwise quite the same.

OREOCARYA NUBIGENA. Apparently perennial and cespitose like the last, with similar foliage and the same harsh bristly pubescence: stems as low, slender, but floriferous only near the summit, and the glomerate inflorescence interrupted: corolla-tube little or not at all exserted: nutlets elongated-ovate, not in the least rugose or granulate but smooth or slightly wrinkled.

On Cloud's Rest, Mariposa Co., California, 10 July, 1889, Messrs. Chesnut & Drew. This has heretofore been listed as *O. leucophæa*, on account of its having smooth nutlets; though in habit, pubescence and form of the corolla, it is as distinct as need be; and, as belonging to the eastern slope of the Sierra Nevada, it is quite outside of the territory of *M. leucophæa*, and under very different climatic influences. The species is much nearer *O. humilis* notwithstanding that its nutlets are so different from those of that group.

OREOCARYA CONFERTIFLORA. Perennial, tufted, the numerous stems from an almost ligneous branching caudex, a foot high or more, leafy up to the strictly terminal dense

and subcapitate cluster of flowers: leaves all lanceolate, acutish, cinereous or subsericeous with a short appressed pubescence, the upper portion of the stem hirsute: corollas very large, the tube much exserted: nutlets sharply ovate-trigonous, smooth and polished.

At Cushenberry Springs, on the north side of the San Bernardino Mountains, southern California, S. B. Parish: specimens distributed for *O. leucophæa*, from which the species is abundantly distinct not only by its short almost capitate inflorescence, but much more by the entirely different achenes; these in *O. leucophæa* forming collectively a conical fruit, while in the present species the nutlet is as broad as high, and the four of them combine to form a depressed-globose or almost hemispherical fruit. It is indeed quite such a fruit as that of the succeeding group of species, and very far from that of *O. leucophæa* and its near relatives.

O. SUFFRUTICOSA (Torr.), Greene, Pitt. i. 57. Low, much-branched perennial, with rigid and brittle stems decumbent at base or to the middle; leaves small, linear-lanceolate: terminal and subterminal geminate spikes with fruiting calyces very distinctly biserial: calyx-lobes ovate-lanceolate: nutlets rather narrowly ovate-trigonous, not strongly depressed or incurved, the polished surface red-brown dotted with many white spots, these slightly elevated and suggestive of tuberculation.

Species peculiar to the elevated plains of the Platte—including the whole region of high country intervening between the various branches of that river—throughout southeastern Wyoming, and to middle Colorado east of the mountains. On passing from middle to southern Colorado, one meets in the valley of the Arkansas with the following:

OREOCARYA CINEREA. Perennial, tufted, but the slender and flexible stems erect, simple, 8 or 10 inches high, leafy throughout, floriferous only near the summit: leaves elongated, linear-lanceolate, obtuse, cinereous on both sides with

a minute short, straight and closely appressed pubescence; the stem and inflorescence hirsute: calyx short, its lobes broadly ovate-lanceolate: nutlets as in the last as to form, but wholly light-gray, smooth.

Confined, as far as I know, to the Arkansas Valley, in southern Colorado, where it occupies low subsaline clayey soils, being associated with such local species as *Frankenia Jamesii*, *Oonopsis foliosa* and certain shrubby chenopodiaceous plants.

OREOCARYA MULTICAULIS. *Eritrichium multicaule*, Torr. Marcy's Report, 262 (as a synonym under *E. Jamesii*). Tufted perennial, twice or thrice as tall as the preceding, far less leafy, the stems stout and rigid, bearing more numerous and elongated spikes at and near the summit: leaves rather broadly oblanceolate; pubescence dense and somewhat tomentose: spikes appearing uniserial and unilateral: nutlets as in the last very smooth and shining.

Frequent in the mountains of northern New Mexico and Arizona; the type Fendler's n. 636, forming a part of Dr. Gray's *Eritrichium* and *Krynitzkia Jamesii*. A similar plant of western Texas may or may not be specifically identical with it.

OREOCARYA ABORTIVA. Perennial, freely branching from the base, the short rather flaccid branches almost prostrate, 3 to 5 inches long, leafy and floriferous throughout: herbage somewhat silvery-silky, altogether destitute of other pubescence, except that the calyces and pedicels are finely and densely tomentose: leaves oblanceolate: calyx short, its lobes ovate-lanceolate: corolla-tube not exserted: nutlets usually solitary (3 of the ovaries abortive), strongly inflexed, the lateral outline subreniform with a stout stipe-like projection from near the middle of the ventral edge, the dorsal side polished and shining, smooth up and down the middle, but granulate along the very acute margins.

Bear Valley, San Bernardino Mountains, California, S. B. Parish; the specimens distributed as "*Krynitzkia Jamesii*," but representing a most distinct new *Oreocarya* with very peculiar fruit; in habit also decidedly unlike any other species at present known.

ALISMA VALIDUM. Annual, stout and low, the scape and inflorescence seldom a foot high and little surpassing the leaves; root a dense tuft of almost filiform fibres: leaves narrowly elliptic-lanceolate, very acute, 5-nerved, 2 to 3 inches long, firm and firmly erect on the stout elongated petioles: branches of the panicle short: petals very small, pale rose-color: achenes about 15 in the whorl, very broadly semi-obcordate, rather thick, the short style appearing as if lateral, being about midway between the base and the apparent summit of the achene.

Muddy margins of pools near Palisade, Nevada, July, 1893 and 1896. The only *Alisma* seen by me in any part of the Humboldt River region; and entirely unlike *A. Plantago aquatica* both in vegetative and fruit characters.

RIBES COGNATUM. Shrub evidently large, and the branches not rigid; younger branches stiffly and densely setose-hispid, the 1 to 3 subaxillary spines short, not very stout: leaves, and especially the long and slender petioles, villous-pubescent: flowers 3 to 5, at the ends of long and slender pendulous peduncles: calyx salverform, the long cylindric tube villous-pubescent, twice the length of the oblong segments, the whole apparently pale flesh-color: petals spatulate-obovate, truncate or retuse, not equalling the calyx-segments: bracts of the raceme rounded or subreniform, glandular-ciliolate: ovaries glabrous.

River banks at Pendleton, Oregon, 17 May, 1896, Mr. Thomas Howell. *R. leptanthum* is the nearest relative of this.

SAXIFRAGA PARVIFOLIA. Scapiform stem stoutish, a foot high or somewhat less, from a radical cluster of few and relatively very small leaves, these ovate, obtuse, slightly toothed or entire, short petiolate, somewhat fleshy, glabrous: scape sparsely clothed with short but coarse glandular hairs, at summit parted into branchlets, each cymosely 3 to 5-flowered: calyx cleft to the middle into deltoid erect segments: petals white, spatulate-oblong, obtuse, more than twice the length of the calyx: filaments filiform; anthers orbicular: mature carpels red, only the beaks divergent.

Grant's Pass, Oregon, 1892, Thomas Howell. Related to *S. Californica* and *fallax*.

CARDAMINE VALLICOLA. Perennial; margins of leaflets with scattered hairs, plant otherwise glabrous: stems clustered from a short stout branched rootstock, stout, erect, 1 to 1½ feet high, leafy up to the branched summit: leaves all lyrate-pinnate, the lowest of 7 or 9, the upper mostly of about 5 leaflets; lateral leaflets variously ovate, entire or few-toothed, the terminal one much larger, somewhat lobed: racemes short, in fruit rather dense: flowers of middle size, white: pods very erect, but on ascending pedicels, slender, narrowly linear, tapering to the rather long style.

Wet meadows along Dale Creek, Wyoming, 30 June, 1896. Intermediate in habit and character between the Rocky Mountain *C. cordifolia* and *C. Breweri* of the Sierra Nevada and Cascades.

# Studies in the Cruciferæ.—I.

## 1. Cardamine *and* Dentaria.

A. P. De Candolle, to whom will always be conceded a place in the first rank of authorities upon the family of the Cruciferæ, says of *Dentaria* that it is "nearly related to *Cardamine*, and distinguished from it by habit. All authors have admitted the two genera, though without assigning them any characters."[1] In a subsequent paragraph he admits that so eminent a specialist as Robert Brown had united the two genera; but he overlooks the fact that a much earlier author, Crantz, had carried into effect the same proposition; so that not quite "all authors" anterior to De Candolle had really admitted the two genera. Moreover, the original Latin of his statement that authors had not assigned characters, but had received the genera upon habit alone, must be favored by a very liberal rendering, when we consider that Tournefort, the very author who first established these genera, distinctly attributes to *Cardamine* the marked character of having "valves separating by a kind of elasticity, rolling themselves into a coil."[2] And similarly Linnæus always insisted upon the same character for *Cardamine*, holding *Dentaria* distinct on account of its lacking that strongly elastic dehiscence.

Between Linnæus and Jussieu appears Crantz, who unites the two under *Cardamine* (that name holding precedence over *Dentaria* in all the editions of Tournefort), ascribing to

[1] Syst. ii. 271.

[2] Elemens, i, 191 (1694).

the whole aggregate those characters which all earlier writers had given to the segregate *Cardamine*.[1]

Appearing twenty years subsequently to Crantz's book, Jussieu's *Genera Plantarum* retains the two genera, though Crantz's claim, that the mature valves in *Dentaria* are elastically dehiscent quite like those of true *Cardamine*, is freely conceded; but at the same time, some new arguments are offered favoring the retention of *Dentaria*. Its calyx, according to Jussieu, is oblong and connivent, while that of *Cardamine* is short and open; and its silique is pointed (*dissepimento valvis longiore*); besides, as a truly natural systematist, Jussieu must needs take into consideration the vegetative characters, and so he makes mention of the fleshy and dentate rootstock of *Dentaria*, adding that the leaves are mostly simple or ternate in *Cardamine*, and digitate or pinnate in the other genus.

Fully two centuries have now passed since these two genera gained, I shall not say open recognition,[2] but formal definition in books of systematic botany. During the first half of that period, the century ending with Jussieu's great work, only one botanist of note felt constrained to unite them. And the second century since Tournefort has not, on the whole, altered the general consensus of opinion; for while it has yielded at least thrice as many efficient men in systematic botany, scarcely three authors of great influence have formally suppressed *Dentaria*. Robert Brown did this

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[1] See Crantz, *Classis Cruciformium*, pp. 66, 126 (1769); a very original kind of a monograph, in which Robert Brown's ideas of *Cardamine* are anticipated by more than forty years. Crantz is unmistakably the author of all those *Dentaria* names as *Cardamine* species, which names in the *Index Kewensis* are credited to Brown; and there are about twenty other names of Crantz's combining or making, in this volume, which appear to have been unknown to the authors of the *Index*.

[2] The Old World genus-type, *Dentaria enneaphylla*, is beautifully figured in Lobel, *Observationes*, p.391 (1570), and proposed by him as a new genus, under the name ALABASTRITES. The very original *Denturia* was some Orobanchaceous plant.

in 1812;[1] but the weight of his authority as a keen empiric was quickly overborne by that of the great newly risen advocate of natural classification, A. P. De Candolle, who strongly reasserted the rank of the genus suppressed by Brown.[2] After this, for forty years or more *Dentaria* found again that almost or quite universal acceptance which had been accorded to it in earlier times; then Bentham came out in favor of all that Crantz in his day, and Brown in his had advocated.[3] Now again since Bentham thirty years have elapsed, and still very few botanists have shown willingness to accept the view he advocated. Asa Gray, although personally inclining to favor any proposition of this kind made by Bentham, always held the two genera to be distinct.

The great majority of active botanists have had their training in Europe, or else in the eastern part of North America, and in neither of these fields is there anything to suggest a doubt of the perfect validity of *Dentaria*. The several *Dentaria* species of both these regions are of so pronounced a generic habit and aspect, that scarcely any group of Cruciferæ is more clear-cut in its seeming distinctness from *Cardamine* and every other. *Cardamine* itself is not at all so unlike *Arabis* or *Sisymbrium* or *Nasturtium* in its whole bearing as it is unlike *Dentaria;* while this last-named group has no analogues, or manifest allies, as to habit. They are peculiar in their dry-sylvan habitat, fleshy rootstock, the absence—or at least the scarcity—of radical or basal foliage; they are naked as to foliage except the ample and almost involucral pair, or whorl, of leaves holding place about midway of the stem; the ample corollas are not evidently cruciform in expansion, the petals diverging only gradually, and to the bell-shaped. They seem, indeed, to be about as far removed from the *Cardamine* type as Anemones of the *A. nemorosa* group are separate from the low and upright species

[1] Hort. Kew. 2 ed. iv. 100 (1812).
[2] Syst. ii. 271 (1821).
[3] Benth. & Hook. f. Gen. i. 70 (1862).

of *Clematis*, as far as habit and floral characters go. Thus effectively do the European and East American species of *Dentaria* conceal their real and close affinity for *Cardamine;* and it is not until Pacific North America is reached that this disguise is put aside.

I do not know of more than two American botanists who have at any time yielded up their earlier prejudices, and adopted the view that *Cardamine* and *Dentaria* are congeneric. One of these two I know to have been brought over by a study of the Pacific coast species; and the other may reasonably be supposed to have reached such convictions in the same way. Alphonso Wood in his *Botanist and Florist*, issued in 1870, transfers all the eastern *Dentaria* species to the other genus. He makes no mention of how he had been brought to that view; but, as he was far enough from being a blind adherent to the doctrines of any great master like Bentham, and, as he had a few years before 1870 made extensive field researches on the Pacific coast, I infer that it may have been the Cardamines of those regions which had chiefly influenced his mind.

Ten years ago the present writer, having then devoted six years to special study of the Californian flora, felt himself obliged to accept Bentham's view respecting this general group.[1] The concession was made as it were under a sort of natural compulsion. From the earliest years of botanical observation and reflection, I have felt averse to receiving within the same genus, plants of pronounced habital dissimilarity; and, if the so-called Dentarias of California and Oregon had been good Dentarias, such plants as any one fresh from Europe or the Eastern States would at first sight have pronounced to be of that genus, I should have been the last of men to have treated them as Cardamines.

On the Pacific slope the number of Cardamines, in the Crantzian and Benthamian sense, is perhaps twice as great as on the Atlantic. Of true *Cardamine* there is a consider-

[1] See Bull. Calif. Acad. ii. 389 (1886).

able number of very clear and excellent species. Of truly typical *Dentaria* there is scarcely one; for even *D. tenella* of Pursh, which is the best of them, has pinnated instead of palmated cauline leaves, and a tuberiferous root in place of a rhizoma; so that even this is rather nearer the ambiguous group, of which the *Cardamine paucisecta* of Bentham is a type, than it is to any European or Atlantic American *Dentaria*.

A quite preponderating number of the far-western species are so exactly intermediate between true *Cardamine* and *Dentaria* that it seems difficult to decide to which of the two to refer them. As far as vegetative characters go, they are perhaps more naturally allied to, or at least more gradually confluent with, *Cardamine*; nevertheless, at the *D. tenella* end of the series they are almost as confluent with true *Dentaria*. But this ambiguous group, while mainly Pacific American, is not without Atlantic coast representatives; for *C. rotundifolia*, *C. rhomboidea* (or *bulbosa*) and *C. Douglassii* (Britton) belong here. There is not the remotest hint of any generic difference between these plants and the Californian *Dentaria Californica* and *cardiophylla*. If these last-named plants and their near kindred are, as placed in the *Synoptical Flora*, Dentarias, such most indubitably are also the aforenamed Atlantic species, though in the book just named they are, without the least reason or consistency, retained in *Cardamine*. Nevertheless it is evident that Mr. Watson supposed his *Dentaria* species all to be distinguishable from *Cardamine* by a character of the corolla, for he attributes to *Dentaria* what he denies to *Cardamine*, "Petals * * * with slender claws and ovate spreading blades."[1] This, as a point of generic distinction, is quite wrong. The Dentarias proper are decidedly more given to exhibiting ascending (not spreading) petals with blade and claw spatulately confluent than are true Cardamines. Moreover, he has in the same treatise merged in one, under *Dentaria*, two species, one of which

[1] Wats. in Gray, Syn. Fl., i. 104.

(*D. Californica*, Nutt.) has spreading petal-blades, and the other (*D. integrifolia*, Nutt.) the other kind of petals.

I have not been able to read up the history of these genera closely enough to ascertain to whom it is that the discovery of unequal cotyledons as a character for *Dentaria* is due; but I suspect that this may prove the most important of suggestions in relation to a diagnostic character for the two genera. If the character hold out, it will easily place those otherwise ambiguous tuberous-rooted perennials in the *Dentaria* series quite unequivocally; for their cotyledons are so extremely unequal that they will rival the best and most typical Dentarias in the possession of such a character. The seedling plants, at least in the Californian species, so far as they have been studied, appear as if actually monocotyledonous from the moment that the plantlets emerge from the ground, so extremely reduced, if not completely abortive, is one of those organs. Upon this point I remark, in the first place, what is certainly an error in Mr. Robinson's description of his *Dentaria cardiophylla*,[1] unless his plant be something quite distinct from my *Cardamine cardiophylla*. Soon after I had published a diagnosis of that plant, I induced its discoverer, Mr. Jepson, to explore the original locality in quest of roots of it, in order that I might if possible study it under cultivation. The result was, that by the beginning of the next rainy season, we had a fine growth of it in the botanic garden at Berkeley. The plants matured seed copiously, and the seed was self-sown, so that by the second rainy season, almost before I was aware of the existence of the seedlings, they had become conspicuous all over the ground in the vicinity of the parent plants. On my first observing them they stood displaying each what seemed a solitary leaf more than a half-inch in length and breadth. The first glance at these organs suggested to me the supposition that they were true leaves, and that the cotyledons were hypogæous. But an examination made it clear at

[1] See Gray's Syn. Fl. i. 155, as to description of cotyledons in this species.

once that this large leaf-like organ was one of the cotyledons, and really the only one that ever emerged from the seed-coat. Of the other, only a dead trace could be found, and that with the remains of its enveloping seed-coat still covering it, and quite above ground.

The genuine *Cardamine* species, it is known, have small and equal cotyledons, even as these appear in well developed and growing seedlings.[1] It is therefore to be hoped that future research may lead to a better establishment of *Dentaria* and *Cardamine* as genera distinguishable not by habit alone, but by seminal and vegetative characters. The group of species with fleshy-rhizomatous and fleshy-tuberiform and tuberiferous roots may in the meantime be provisionally indicated as constituting the genus *Dentaria*. This will be better than the proposing of the many western and the few eastern species as forming a new genus intermediate between the two. But the one thing which cannot rationally be allowed is, that the *Dentaria* series shall end absolutely arbitrarily, as it does end in the *Torrey & Gray Flora*, and in *Gray's Synoptical Flora*.

The following far-western species are to be transferred to DENTARIA, as are also the eastern ones already mentioned.

D. CUNEATA. *Cardamine cuneata*, Greene, Bull. Calif. Acad. i. 74.

D. SINUATA. *Cardamine sinuata*, Greene, Eryth. i. 148. This was collected as far south as San Mateo Co., California, by Mr. J. Burtt Davy, soon after its first publication.

D. PULCHERRIMA. *Cardamine pulcherrima*, Greene, l. c.

D. QUERCETORUM. *Cardamine quercetorum*, Howell, Eryth. iii. 33.

The two or three eastern species belonging with the above are much confused, as to their earlier bibliography.

[1] See Lubbock on Seedlings, i. 148, 149.

D. RHOMBŎIDEA. *Arabis rhomboidea*, Pers. Syn. ii. 204. *Cardamine rhomboidea*, DC. Syst. ii. 246. *C. bulbosa*, B. S. P. Prel. Cat. N. Y. 4. This species has been supposed to be identical with the *Arabis foliis ovatis denticulatis glabris* of Gronovius, and therefore to be the *Arabis bulbosa* of Schreber. But as there is nothing in either the name or the synonyms of Gronovius to indicate what plant was intended, *A. bulbosa*, Schreb., is a *nomen nudum*. Not a description which I can find, anterior to Persoon, would lead any one to even this group of plants. He is the first to mention rhomboid leaves and a tuberous root; characters by which the botanist is led at once to these tuberous-rooted Dentarias notwithstanding that they are misleadingly placed under *Arabis* by the author.

D. ROTUNDIFOLIA. *Cardamine rotundifolia*, Michx. Fl. ii. 30. This I consider rather more likely to be the plant called *Arabis bulbosa* by Schreber and Muhlenberg than the preceding, my reason being the geographical one. The diagnosis given in Michaux is almost too brief and deficient to save the name.

D. DOUGLASSII. *Arabis Douglassii*, Torr. in T. & G. Fl. i. 83, as a synonym under *C. rotundifolia*. *Cardamine Douglassii*, Britton, Trans. N. Y. Acad. ix. 8. A beautiful, and perfectly distinct species, as I learned to recognize it in the middle Mississippi Valley thirty years ago.

## 2. *A proposed new genus*, SCHŒNOCRAMBE.

The plants to which I desire to assign the above generic name were first brought imperfectly to the knowledge of botanists, from the northern part of the Rocky Mountain region, by Douglas and by Wyeth. The specimens collected by Douglas were mistaken by Sir William Hooker for those of a species which had for some time been known from the steppes of Siberia and northeastern Europe, a plant which

had been referred variously to *Brassica*, *Cheiranthus*, *Erysimum* and *Sisymbrium*, Sir William following De Candolle and Bieberstein in calling it *Sisymbrium junceum*. What relation our American plants sustain to the Old World *S. junceum* I know not; but they who have compared specimens seem to have agreed quite unanimously that ours represent at least a distinct species, or perhaps two species; so that *Sisymbrium junceum* is now excluded from the American flora; while to our forms has been assigned the name *Sisymbrium linifolium*, a name which doubtless embraces two species, if not three, at present more or less imperfectly known.

Wyeth's specimens formed the basis of two species as proposed by Nuttall, namely, *Nasturtium pumilum* and *N. linifolium*. Very shortly after Hooker's cataloguing of *Sisymbrium junceum* as an American plant on the authority of Douglas' specimens, Nuttall published the aforenamed in the *Journal of the Philadelphia Academy*, though not recognizing the identity of Hooker's *S. junceum* with either of his own new species of *Nasturtium*. Four years later, in the *Torrey and Gray Flora*, Nuttall seems to have consented to the placing of his two plants under *Sisymbrium*, and these, headed by Hooker's *S. junceum*, form in that work a supposed group of three species of reedy *Sisymbria* credited to the northern Rocky Mountain plains and valleys.

The *Sisymbrium* of our books, like some other large conventional genera of Cruciferæ, is absurdly heterogeneous, neither really defined by any author, nor possible to be defined until, by judicious exclusions, a truly definable and naturally delimited group shall alone be left in possession of the name. *Sisymbrium*, as we have it, has very long been a sort of convenient general receptacle for almost any sort of new siliquose crucifer which, though in need of an allotted place, may not by habit or marked character suggest affinity for *Arabis* or *Brassica* or *Cardamine*, or some other.

The species here to be discussed have already been named, at least in part, under two other genera outside of *Sisymbrium;* Nuttall having referred them to *Nasturtium* in the beginning of their history, and Marcus Jones having proposed for them a place in *Erysimum.* This idea may have been an original one in the mind of Mr. Jones; but Hooker and Arnott very long ago made a like suggestion.

In mode of growth there is nothing about this type to suggest *Erysimum* as we have understood that genus; nor is there a trace of that peculiar forked and appressed pubescence found in every species of *Erysimum* and *Cheiranthus.* The pods of *Erysimum* are either sharply four-angled, or else at least the valves have a strong midnerve. But in the things we are dealing with the pods are terete and without a midnerve, as far as I have been able to discover. On each of these points they to me seem far indeed from that group to which Mr. Jones would refer them.

My own view is, that we have here one of the most pronounced among American genera of crucifers; and that there is no intimate relation between them and any of those diverse types which have made up the conventional *Sisymbrium;* that they are not at all allied to that exceedingly natural and well-defined group, *Cheiranthus* and *Erysimum;* that, as a genus strongly demanding recognition, SCHŒNOCRAMBE will find its proper place somewhere between *Thelypodium* and *Stanleya.*

It is, if I mistake not, an altogether unique type of cruciferæ in the possession of long rambling branching horizontal roots or rootstocks which send up, at intervals, slender reedy shoots without trace of radical leaves. With the exception of one or two species of *Stanleya,* we have in North America almost no such perennial crucifers; our more enduring species—those not annual or biennial—becoming so through woody induration of the crown or caudex, or by fleshy rhizomes or tuberous roots. Not even *Stanleya* is normally perennial after the manner of SCHŒNOCRAMBE; I have only

now and then seen a *Stanleya* whose roots sent up young shoots from underground and at the distance of a foot or two from the parent stem. But these more slender and reedy things of the *Stanleya* region have as their normal mode of growth just this which in *Stanleya* is exceptional. I must not allow myself to be interpreted as meaning that *Schœnocrambe* and *Stanleya* are very near allies. The fruits of the two are without any special likeness to each other; though the flower buds, in both quite large for the size of the flower, are much alike; and there are agreements between the two which are unmistakable in the texture and the sensible qualities of the herbage, as also in the cut of the foliage in those of the species having divided leaves.

With me the type of the new genus is—

1. SCHŒNOCRAMBE LINIFOLIA. *Nasturtium linifolium*, Nutt. Journ. Philad. Acad. vii. 12. *Sisymbrium linifolium*, Nutt. T. & G. Fl. i. 91. *Erysimum? glaberrimum*, H. & A. Bot. Beech. 323. *E. linifolium*, Jones, Proc. Calif. Acad. 2 ser. v. 622. My first study of this species was made some seven years since, in just the region whence Nuttall had his original materials. The stems are simple only when young and beginning to show flower and fruit. Later they branch rather freely. The leaves of stem and branches are all narrow and entire, at least after the vernal season is past; but the earliest and lower leaves are coarsely few-toothed. The herbage is quite green and without bloom. From this northern type, which however is common as far southward as southern Wyoming, it seems necessary that the following should be distinguished.

2. S. PINNATA. Stouter and taller than the last, very glaucous throughout, apparently never branching, almost leafless above, the lower leaves rather numerous, pinnatifid into from 5 to 8 pairs of obovate-oblong entire segments: raceme elongated and with stout rachis.

Plant of more southerly range than the last, occurring in Utah and Nevada. The best specimen seen is in the National Herbarium, and was collected somewhere in Utah in 1875 by Mr. L. F. Ward. Mr. Watson's n. 96 from the East Humboldt Mountains, described as having lower leaves runcinately pinnatifid and the upper linear and entire, may belong here; though there is nothing of the runcinate about the leaves of other Nevadan specimens; and there are no entire leaves in the duplicate (?) of Mr. Watson's plant deposited in the U. S. Herb., even the cauline or rameal being cut much after the manner of those of a *Stanleya*.

3. S. PYGMÆA. *Nasturtium pumilum*, Nutt. Journ. Philad. Acad. vii. 12 (1834), not of St. Hilaire (1824). *Sisymbrium pygmæum*, Nutt. in T. & G. Fl. i. 91 (1838). This is described as being a dwarf, with lyrately pinnatifid lower leaves, and herbage not, as in the type, devoid of pubescence. That nothing has been added to the knowledge of the plant since Nuttall's time should be no reason for suppressing the species.

## 3. ERYSIMUM *and* CHEIRANTHUS.

The genera of cruciferæ are exceedingly difficult to define in set terms. Hence what is always convenient is here quite necessary, namely, that for the satisfactory arranging of species in generic groups, a certain very marked type shall be chosen, and the genus be allowed to at once illustrate and define itself; the species showing close affinity for the chosen type, if they exist, being admitted and all others excluded from the genus; this to be done as decidedly when it happens to leave a genus monotypic as upon any other occasion. Only by just this kind of process was the illustrious Tournefort able to classify this important family of plants. And that his classification of them was eminently successful and satisfactory is certain, especially as one compares it with the endeavors of Linnæus, most of whose genera of cruciferæ

are long since unanimously conceded to be aggregates, while those of Tournefort are for the most part found acceptable still.

Linnæus, it is true, chose a generic type; but his criteria of affinity were empirical. He judged of relationship by technicalities of flower and fruit, ignoring habital resemblances. His genus *Erysimum* well illustrates this. He chose for its type precisely the species which Tournefort had done; but he gathered things into the genus according to technicalities of the siliques alone. His type was a plant with somewhat angular pods quite erect and parallel with the stem or rachis. It is as if, having jotted down the salient fruit characters of his type, he had straightway gone counter to his own doctrine about allowing a genus to fix its own character, by admitting to this one such species as came nearest responding to the demands of the artificial character, ignoring those habital marks which furnish the best clew to natural relationship. This is really making the character determine the genus, not the genus the character. And the result, in this instance, has been that the four species of his genus *Erysimum* are, in spite of their approximate agreement as to angular and erect pods, representatives of about four genera, according to the judgment of posterity. One must be the type of *Erysimum*. The second is known as the type of *Barbarea*. The third is the monotypic genus *Alliaria*, while the fourth goes into Linnæus' own genus *Cheiranthus*.

The type-species of *Erysimum*, whether one reckon genera from Tournefort or from Linnæus, is *Erysimum officinale*, Linn. Here is given an opportunity for any one among the champions of priority to explain why in even the most approved of recent books and catalogues this, the head and front of Linnæus' genus *Erysimum* is referred to *Sisymbrium*, and yet a pretended Linnæan *Erysimum* is retained. If the very type of *Erysimum* be a *Sisymbrium*, then there is no *Erysimum* at all. This is the doctrine of all of us, advocates of priority. Why are some of us so openly at war with our

own rules? Certainly no rule relating to the observance of priority has been more generally recognized and deferred to than this, that a genus, as to its name at least, stands or falls with its type-species; no rule is more indispensably necessary; and nothing but endless change and confusion can come of the neglect of it.

For such an un-Tournefortian and un-Linnæan *Erysimum* as that of all recent authors, the authorship seems to rest with Robert Brown, the elder De Candolle, and authorities of more recent times. But if we are to take generic names from Tournefort and Linnæus our *Erysimum* must consist of ERYSIMUM OFFICINALE, Linn., and its true congeners, if it have any.

In my *Manual of the Botany of the Region of San Francisco Bay* I gave expression to the opinion that such plants as compose the type of *Cheiranthus*, Linn., and *Erysimum*, DC., form one natural genus notwithstanding that the pods of the one group are quadrangular and of the other flat. I did not know, at that time, that any author before me had given expression to the same idea; and I have been not a little surprised to see that in the *Synoptical Flora*, the same doctrine, so entirely opposed to time-honored empiricism, is reasserted.

The *Cheiranthus* types had been received by Tournefort under his *Leucoium*, and were well removed by Linnæus; and it had been better to have retained for these the simple Arabic name *Cheiri*, a name which Adanson sought to restore in place of Linnæus' Latinized alteration of it. Still, I think that Linnæus has a right of priority in his name *Cheiranthus*, and that therefore it ought to stand. No one anterior to him had defined such a genus. I can therefore conscientiously, and in conformity to the all-important principle of priority, propose the adoption of the following species under the CHEIRANTHUS genus-name. In looking into the bibliography of the species, I have been pleased with the discovery that Nuttall early in his botanical career prac-

tically combined the quadrangular-podded species with this genus in naming as *Cheiranthus asper* the plant which we all have known as *Erysimum asperum*.

The American species, with which I chiefly have to do, are not reducible to defined groups, and consequently need not be taken up after any special order of sequence.

1. C. INSULARIS. *Erysimum insulare*, Greene, Bull. Torr. Club, xiii. 218. Shrub of certain Californian coast islands, and one of the nearest relatives of the Old World type-species of the genus, *Cheiranthus Cheiri*, the common Wall-flower.

2. C. CAPITATUS, Dougl. in Hook. Fl. i. 38. *Cheiranthus asper*, Ch. & Schl. in Linnæa, i. 14, not of Nuttall. *Erysimum grandiflorum*, Nutt. in T. & G. Fl. i. 96: *E. capitatum*, Greene, Fl. Fr. 269. High bluffs and low sandhills of the Californian and Oregonian seaboard, but by no means a "saline" plant, as the authorship of the *Synoptical Flora* would make it. It never appears in the saline soils of the region, nor even near such places. The plant is decidedly perennial, as Nuttall said; and by its flattened pods it is one of the more typical among the species of *Cheiranthus*. The flowers, usually of a delicate cream-color, vary to sulphur and lemon yellow, especially northward at Crescent City, California, and in Oregon; and there is a character of the pubescence which I do not find mentioned by any writer. Though the stem and some leaves show more or less of the simply divided and divaricately appressed hairs usual in the genus, the lower ampler and less pubescent leaves are more or less stellate-pubescent, the hairs being divided into 3 and 4 branches instead of two.

3. C. ARENICOLA. *Erysimum arenicola*, Wats. Proc. Am. Acad. xxvi. 124. Also perennial, like the foregoing, but subalpine on the mountains of Washington, and with flattened pods.

4. C. OCCIDENTALIS, Wats. Proc. Am. Acad. xxiii. 261. *Erysimum occidentale*, Robinson, in Gray. Syn. Fl. i. 144. This is another seemingly excellent species of Oregon and Washington, characterized as having winged seeds.

5. C. PERENNIS. *Erysimum asperum perenne*, Coville, Death Val. Exp. 64, t. 3. Plant of subalpine districts of the Californian Sierra; and, in general, much less like typical *C. asper* than the plate published by Mr. Coville indicates. In my specimens from above Donner Lake, as well as in some of Mr. Coville's, the lowest leaves are oblong-obovate, obtuse, perfectly entire, and with long slender petioles. In all the forms the pubescence is scanty, insomuch that the herbage is green, not at all approaching the cinereous hue of *C. asper*. I have not seen this in fruit either in the field or herbarium. From the analogous subalpine perennial of the Rocky Mountains it differs notably in habit, foliage, and less saccate sepals, as I shall indicate later.

6. C. ANGUSTATUS. Perennial, slender, erect, 2 feet high or more: leaves very narrowly linear-lanceolate, entire or few-toothed, few and scattered above, but densely clothing the basal part of the stem and adjunct short sterile branches of the subligneous caudex, the whole plant subcinereous, the stem with the usual divided appressed hairs, the pubescence of the leaves parted to the middle only, but appressed, thus appearing 3-rayed-stellate: corrolla large, yellow, not regularly cruciform, the lower pair of petals parallel to each other, and, as a pair, distinctly sundered from the upper two, these not parallel but divergent from one another: pods in a long lax raceme, quadrangular, elongated, slender, ascending, slightly incurved, very notably acuminate.

Sandy banks of the San Joaquin River in the interior of California, where specimens in flower and fruit were colleeted by the writer, 14 April, 1887.

Greene

7. C. CALIFORNICUS. *Erysimum Californicum*, Greene, Eryth. iii. 69. Biennial, very stout, the stem and branches strongly angled: leaves runcinate-toothed: pubescence of the usual divided and appressed hairs extending even to the outside of the large petals, these divergent in pairs and thus irregularly cruciform: pods spreading, slender, elongated, sharply 4-angled, not beaked.

Of the inner Coast Range foothills in central California. By a concise but thorough diagnosis of this species given in the third volume of *Erythea* it is made clear that this can be no near ally of *C. capitatus;* for, in contrast with the stout flat pods of that species, are the long slender sharply angular ones of *C. Californicus*, at least according to the description. It did not at first occur to me that the description would fall under the criticism of a professed botanist unable to draw the inference that a pod "sharply rhombic" in cross-section must be as sharply in some way 4-angled when viewed as a whole.[1]

8. C. ASPER, Nutt. Gen. ii. 69. *Erysimum asperum*, DC. Syst. ii. 506; Hook. Fl. Bor.-Am. i. 64, t. 22. The genuine *C. asper*, with which several readily distinguishable species have latterly been confused, is excellently represented by the plate in Hooker. It inhabits chiefly the lighter and somewhat sandy soils of the prairies of the Dakotas, northwestern Minnesota, and Manitoba, ranging southward to the lower foothills of middle Colorado Mountains. Its pubescence is wholly of completely 2-parted appressed hairs and is dense. The large perfectly cruciform corollas form a short compact raceme, this little elongated even in fruit; the greatly elongated pods almost divaricately spreading. A very considerable proportion of the Rocky Mountain region herbarium specimens under this name belong to the next.

9. C. ASPERRIMUS. *Erysimum pumilum*, Nutt. in T. & G. Fl. i. 95, probably. Low and stout, simple, or the racemes

[1] See Gray's Syn. Fl. i. 144, under *Erysimum grandiflorum*.

several, the root no more than biennial; the whole plant very rough with uncommonly rigid hairs which, though divided as usual, are short and not very closely appressed: flowers pale yellow, quite intermediate in size between those of *C. inconspicuus* and *C. asper*: pods long, slender, ascending, in a short raceme.

That this is the real *E. pumilum*, Nutt., I have no doubt, though it is hardly a dwarf species. Any one familiar both with Nuttall's type-specimens of western plants, and of the species as they grow in their native soil, will know that the man as a collector was wont to pick up small and pitiably unrepresentative specimens of things. And thus the name *pumilum* with him is very commonly misleading. It is to be noted that he found the *E. pumilum* in the same region where *E. parviflorum, i. e., Cheiranthus inconspicuus*, also was obtained; that he published them the one directly after the other, and compared them as closely related species. Now it is thoroughly well known to me that just these two plants and no others of their genus are common on those "dry elevated plains of the Rocky Mountains"[1] (of Wyoming) to which he refers and which he traversed. It is as clear, too, that this by no means dwarf, though truly small-flowered plant, is wholly distinct from *C. asper*, and really much nearer *C. inconspicuus*, from which its more obvious harsh pubescence, larger flowers, and shorter racemes of longer pods are all that distinguish it.

10. C. INCONSPICUUS. *Erysimum inconspicuum*, MacM. Metasp. 268. *E. parviflorum*, Nutt. in T. & G. Fl. i. 95, not Pers. Species very well marked not only by its very small pale petals, and short suberect pods in a long raceme, but also by the green color of the herbage, the peculiar hairs universal in the genus being very scanty and scarcely noticeable in this plant. Its center of distribution seems to lie between southern Wyoming and Montana; and here I have

[1] See Torrey & Gray, Fl. i. 95.

repeatedly observed that it has shown a decided preference for railway grades and embankments; and along these lines it has certainly already passed beyond its natural habitat. I suspect that in the Minnesota Valley, where it is said to occur along railway tracks, it is a somewhat recent importation.

11. C. ARKANSANUS. *Erysimum Arkansanum*, Nutt. in T. & G. Fl. i. 95. What might be expected to prove thoroughly good characters are attributed to this southwestern plant, in the place where it was first published: and, from the careful examination of very numerous specimens gathered in Missouri, Arkansas, Texas, New Mexico, etc., I find that they hold well. As compared with *C. asper*, the pods are, as Nuttall said, tapering at summit, and they are also shorter and less spreading. The pubescence of the leaves is also remarkably unlike that of *C. asper*, though Nuttall's description of it as 3-parted is not quite accurate. The hairs are cleft to near the middle, but so appressed as to seem 3-radiate. The leaves are constantly broader and thinner than those of the plant of the far northern habitat. Its nearest relative is not *C. asper*, but

12. C. ELATUS. *Erysimum elatum*, Nutt. l. c. Not easily distinguishable from the preceding by any difference in the pubescence; but foliage narrower, mostly entire; flowers much longer, but petals narrower, probably arranged irregularly, after the manner of other far-western species. This is traceable throughout Oregon and California, in the foothills of the Cascades and Sierra; though possibly the plant of extreme southern California, with broader greener foliage, may be identical with *C. Arkansanus*.

13. C. WHEELERI. *Erysimum Wheeleri*, Rothr. in Wheeler's Report, vi. 64. While Mr. Rothrock's description clearly enough indicates a rather strongly characterized species,

specimens more recently collected in the same general region abundantly confirm it. Such is one obtained on Mt. San Francisco in northern Arizona, by Mr. Knowlton, in 1889. The species is more roughly and canescently pubescent than any other; is tall, erect, and very strict, both the leaves and the pods being suberect, the latter short, stout, subterete and obtuse, being also about as conspicuously canescent as the leaves, and the fruiting raceme is often more than a foot long. Its range seems to be from eastern New Mexico to northwestern Arizona.

14. C. ARGILLOSUS. Stout biennial, simple, mostly 5 to 10 inches high, very leafy, the whole herbage pale almost to whiteness with the usual pubescence: leaves narrowly lanceolate, entire or runcinate-toothed, crowded upon the lower part of the stem and ascending or suberect, not spreading and rosulate as in other species: raceme densely subcapitate or more elongated: flowers large, pale yellow; sepals densely pubescent, not strongly saccate at base; petals glabrous, the blade broad and ample.

On clayey bluffs skirting the valley of the Arkansas near Pueblo, Colorado; collected by the author in May, 1873, and not since seen by him either in the field or in any of the herbaria.

15. C. SYRTICOLA. *Erysimum syrticola*, Sheld. Bull. Torr. Club. xx. 285. Making due allowance for errors in the descriptive terminology of an author who can say of a plant that it is "glaucous throughout with close appressed hairs," the characters of flower and fruit which Mr. Sheldon assigns clearly indicate something distinct enough from both *C. asper* and *C. inconspicuus*. That it is cinereous or pale by the abundance of the appressed pubescence must exclude it from the latter, while the very small petals and short suberect pods (of only $\frac{1}{2}$ to $1\frac{1}{2}$ inches' length) would as conclusively preclude its being referred to *C. asper*. It is unfair to

reduce the species so long as it is not shown that the strong characters assigned do not exist.

16. C. NIVALIS. *Erysimum asperum*, var. *pumilum*, Porter & Coulter, Fl. Colo. 8, not *Erysimum pumilum*, Nutt. Low multicipitous perennial, bearing several separate tufts of leaves and as many short flowering stems on a branching crown or caudex: herbage green, but not without some of the usual completely 2-parted and closely appressed pubescence: leaves linear or narrowly lanceolate, mostly entire: racemose stems only 2 to 6 inches high, commonly simple, often floriferous almost throughout: flowers often $\frac{3}{4}$ inch long, but not proportionately broad, the claw of the petals being out of all proportion to the lamina; calyx very strongly cordate at base: pods suberect, almost terete, taper-pointed.

Peculiar, so far as known, to subalpine heights of the Colorado Rocky Mountains; in later catalogues, and in all the herbaria, taken for Nuttall's *E. pumilum*, probably for no better reason than that the name befits the plant; but Nuttall never saw this, nor anything much like it. A mere analogue of the subalpine *C. perennis* of the Sierra Nevada, but in nowise closely related to it, as the great differences in habit and floral characters clearly indicate.

It may be a red-flowered form of this which, in Porter & Coulter's Flora, has been taken to represent *Hesperis Pallasii;* but of this I am not certain. However, a plant of southern Colorado, with very beautiful rose-red corollas, I wish to name as a variety AMŒNUS of *C. nivalis.* Of this variety I have seen no specimens that seem to have a branched caudex, or to be of more than biennial duration; and, if I mistake not, it is a plant of much lower than alpine or subalpine elevations. Typical *C. nivalis* is often found far above timber-line and truly alpine; and it flowers even the second or third year from the seed, in which state, it would easily pass for a biennial, in the herbarium. Its large flowers are of a rather light yellow.

17. C. TURRITOIDES, Lam. Encycl. ii. 716. *Erysimum cheiranthoides*, Linn. Sp. 661; perhaps also *Cheiranthus erysimoides*, Linn. l. c., so accepted by Hudson, Fl. Angl. 2 ed. 287, and again intimated as probable by Lamarck. l. c. *C. muralis*, Berhn. *fide* Steudel. *Cheirinia cheiranthoides*, Link, Enum. Berol. ii. 170. *Erysimastrum cheiranthus*, Trautv. in Act. Hort. Petrop. viii. 105.

Few if any other plant-species have a more perplexed post-Linnæan synonymy than this; and not the least of the bibliographical difficulties of the situation grows out of the question as to whether Linnæus had not the same species, upon the same page, under two distinct binary names; appending it as kind of suffix to his absurd *Erysimum*, and forthwith placing it as the type of his own genus *Cheiranthus*. In view of all the possibilities, I shall be deemed pardonable for not having here added to the synonymy. The species, with its full history and bibliography, would form an excellent subject for a learned thesis, the working out of which wouid give insight into the intricacies of bibliography and synonymy, and into the incompetency of Linnæus to be an authority in the matter of plant genera.

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STENOPHRAGMA VIRGATUM. *Sisymbrium virgatum*, Nutt. in T. & G. Fl. i. 93. I have made repeated field examinations of this plant on its native soil in Wyoming, and have found it easily congeneric with the type of *Stenophragma*. The siliques, though described by Nuttall as "somewhat terete," are, in their full maturity, even more distinctly quadrangular than are those of *S. Thaliana*. The septum itself is also narrower, and has about the same reticulation.

# Remarks on Acaulescent Violets.

I wish here to resume a discussion of certain East American stemless violets which, begun in May last,[1] was interrupted at the time by the public announcement of a paper to be read before the Biological Society of Washington, on the same topic, by my friend Mr. C. L. Pollard. As Mr. Pollard's paper was issued in printed form soon after having been read,[2] I shall here make special reference to a number of its items; and I do so with all the more satisfaction since he and I had independently reached the same conclusions respecting the validity of several species long suppressed by recent authorities.

The neighborhood of Washington is rich in violets; and, as the whole flora is about the same which extends from northern Pennsylvania and New Jersey to North Carolina, the ground is classic for violets, at least representatively; for, not only was it from this region that all American species early cultivated in Europe and published by early European botanists had been sent, it was upon this ground that all classic American authorities upon the genus—Pursh, Nuttall, Schweinitz, Muhlenberg and Le Conte—made their observations and were enabled to distinguish their species.

Upon this territory, the following segregates from Gray's confused *Viola sagittata*, indicated by Mr. Pollard, are perfectly clear.

V. ovata, Nutt. Fairly described by Nuttall, who, however, was wont to misuse the term *ovate*. Le Conte, whose excellent description of the species leaves small room for

[1] See page 33 preceding.

[2] Proc. Biol. Soc. x. 85–92.

amendment, more accurately defines the leaf-outline as oblong-ovate; though in the enlarged summer foliage there is a strong suggestion of the deltoid or triangular-ovoid. The plant is several times larger than *V. sagittata*, has a more fleshy texture and a marked pubescence. The petioles are short in proportion to the lamina, and this is never in the least sagittate or incised toward the base. No field botanist will ever be persuaded that it is a mere variety of *V. sagittata*.

Mr. Pollard cites *V. ciliata*, Muhl., as a synonym of *V. ovata*; but he does not state upon what authority he thus identifies the Muhlenbergian plant, the mere name of which is all that is printed by that author. I suppose the authority for the identification is Le Conte, who as a contemporary of Muhlenberg and perhaps acquainted with him and his plants, may be relied upon in such a case. But as far as the name *ciliata* goes, it would better befit the following.

V. DENTATA, Pursh, *fide* Le Conte. *V. emarginata*, Le Conte. Pursh's character of an oblong leaf-outline has no application except in the case of young plants beginning to flower. Before the flowering is past, the larger leaves are deltoid-subcordate, and nearly as broad at base as long. Still later the large early summer foliage is quite as broad as long, at least in the plant of the vicinity of Washington. The absence of pubescence from the surfaces of the leaves brings out with distinctness the ciliate character of the margin. There is in this region not a hint of intergradation between this and *V. sagittata*, while in foliage and general appearance there is, as Le Conte remarked, no likeness between them. I should have thought that the herbarium students in reducing this species must have placed it under the *cucullata* aggregate rather than with the *sagittata*.

In our district both these species occur only on elevated gravelly or sandy wooded or bushy hills, though not in the same localities, *V. ovata* choosing hard gravelly soils and slopes looking northward, while *V. dentata* confines itself to

a richer soil and a warmer easterly or southerly exposure. *V. sagittata* with us occurs only in low moist situations, among small grasses, rushes and sedges, not far from streams or springs. All three are alike in producing their late cleistogamous and apetalous flowers on slender erect peduncles. My reason for mentioning this will appear under the discussion of the next group, where a very different condition of things exists.

Phytographically first in that perplexed alliance clustering around *V. cucullata* is—

V. PALMATA, Linn. In the very earliest records of the species we find allusion made to the variability of its foliage. Clayton described it as having "some leaves incised, others entire."[1] Gronovius observed the principal leaves to be "palmately sinuate," and the lower and smaller ones to be "undivided and reniform."[2] Linnæus himself characterizes the leaves as either palmately 5-lobed or undivided.[3] There is less definiteness in this than in the descriptions drawn up by his predecessors, for he does not specify what leaves are palmated and what undivided. Nevertheless his very vagueness is safer; for I find occasional patches of plants easily referable to true *V. palmata* in which no lobe or incision of the margin is found in any of the leaves, great or small, early or late. Still I have no difficulty in distinguishing between any form or phase of this and *V. obliqua* or *cucullata*. It is always notably pubescent, the petioles being even rather strongly villous or villous-hirsute. It is a more solitary plant, with fewer leaves and flowers, the rootstock seldom branching or producing more than one growing point, the individuals never colonizing and taking possession of any given space, as *V. obliqua* usually does. It is never found save in light but dry and rather rich open woods and thickets. I believe that the form found in the District of Columbia

[1] Gronov. Virg. 1 ed. 108 (1739).
[2] Gronov. Virg. 2 ed. 135 (1762).
[3] Spec. Pl. 933 (1753).

and adjacent Maryland and Virginia is that distinguished by Le Conte specifically, under the name of *V. congener*; but there may be reason for thinking this a perfect equivalent of typical *V. palmata*, and I have no doubt Mr. Pollard has erred in referring it to *V. obliqua*. A characteristic of this species and the next, of which I find no mention made by any observer, is that the apetalous flowers produced in late spring and early summer are subterranean.

V. OBLIQUA, Hill? I should not like to have put into print such a statement as this: "*V. obliqua*, Hill, well figured and unmistakable in his Hortus Kewensis."[1] The figure does not half represent any violet that ever grew in any country. It is glaringly false in representing flowers erect on peduncles perfectly straight to the very summit! And as for the leaves, one might safely challenge the whole fraternity of American botanists to produce from any part of our territory anything to match them. They are so entirely destitute of any special specific character as violet leaves that, separated from that violet rootstock and the somewhat violet-like flowers, who would be able to decide that they were the leaves of a violet and not those of some other cordate-leaved herb, or shrub, or tree? In a word, this figure in the *Hortus Kewensis* is, like most of Hill's plates of plants, about as vague and botanically useless a conventionality as an unbotanical draftsman could well perpetrate with a living plant before his eyes.

This particular figure is not so unmistakable but that Pursh thought the plant now known as *V. blanda* to have been meant, and Dr. Gray himself at an earlier day was disposed to construe it as meant for *V. rotundifolia*![2] But such experienced and critical botanists as Michaux, Nuttall, and Le Conte ignore it altogether, as they may have felt justified in doing, inasmuch as both figure and description are in important points false even to the genus *Viola*. But

[1] A. Gray, in Bot. Gaz. xi. 254.

[2] See Torr. & Gray, Fl. i. 138, under *V. rotundifolia*.

notwithstanding that the flowers of Hill's figure are a fiction, and the leaves an unbotanical artist's conventionalism, it is more than possible that one of our commonest American violets was held in view. I have little doubt that to one of two very distinct species long known under the name of *V. cucullata* may be conceded the name *V. obliqua*, Hill. It is a glabrous plant, showing never a trace of the villous hairiness of *V. palmata*, its leaves always crenate-toothed and somewhat evenly so, never in any manner lobed or cut; at flowering time often presenting the general leaf-outline given in Hill's figure, though the later leaves are usually broader than long, being reniform-ovate or even ovate-reniform. This species is the most common of all East American violets, preferring heavy but not wet soils, often growing in great abundance in rather low copses or even somewhat dense moist thickets. Its apetalous summer flowers are on very short horizontal peduncles, the growing ovary being concealed under dead foliage or the lighter mold about the base of the plant. The ovary itself is obovoid and short, not angular. I believe that the species has several specific names already; but I am confident it can never be proven that it is not *V. obliqua*, Hill; and since that is the oldest possible name for it, I here leave it under that designation.

The other extremely distinct species, confused with this even by Mr. Pollard, unless unknown to him, I shall for several reasons here designate as—

V. CUCULLATA, Ait.? This is a very glabrous plant, of more tender and succulent herbage, more decidedly cucullate leaves of a more vivid (not so deep or dark) green, and paler flowers, the petals with a spot of darker violet just above the white basal part or claw. It is most perfectly distinguished from all the foregoing by bearing its cleistogamous flowers on greatly elongated very slender peduncles which are strictly erect, both the growing and full-grown ovaries being a half-foot or more above ground and up

among the leaf-blades. The capsules in this are twice as long as in any of the above, are quite prismatic, i. e., of equal thickness from one end to the other, and distinctly though obtusely trigonous. It inhabits only decidedly wet and boggy open meadows, or else equally wet sedgy places along the margins of streamlets in more shaded ground.

Of course, I cannot be positive that this is *V. cucullata* of Aiton, or of any other author. Its more strongly cucullate leaves, however, render it not improbable that it may have been the plant he had in view. Nevertheless, if our stemless blue violets do really, as my own researches of one season indicate, develop their best specific characters during their summer period of cleistogamous flowering, it will only render the old, brief, imperfect descriptions drawn from insufficient vernal material less useful than ever. I really think that no one knows, or ever will know, what *V. obliqua* and *V. cucullata* of the Hortus Kewensis are.

V. VILLOSA, Walter? This is truly no better than a *nomen nudum*. Every one of the descriptive terms that author uses will apply equally well to every other one of our blue-flowered, stemless violets that is not glabrous better than to the one which, as we all assume, he ought to have had in mind; for the accepted *V. villosa* is not villous. It is rather stiffly hirsutulous. But the species, as we understand it, is a very good one; and all I have to add to the account others have given of it is, that its later larger leaves are borne an inch or more above the surface of the ground on slender petioles, and that the ovaries of the apetalous flowers are partly or wholly buried on short horizontal peduncles. It is therefore related to *V. palmata* and *V. obliqua* of this paper, and not the bog-meadow *V. cucullata*.

The following are far-western specific or subspecific allies of the foregoing:

V. NEPHROPHYLLA. Glabrous throughout; leaves firm and almost subcoriaceous, the earlier from reniform to round-reniform, very evenly crenate, an inch wide, on petioles of

an inch or more, the later ones thrice as large, cordate-reniform to cordate-ovate, crenate-serrate, on petioles of 3 to 5 inches: peduncles very slender like the petioles, from shorter than the leaves to somewhat exceeding them: sepals oblong, obtuse, 3-nerved, scarious-margined: petals deep violet, but white at the base and with veins of dark violet, and more or less villous: apetalous summer flowers on slender ascending short peduncles: seeds rather large, exactly obovate.

In dry thickets of scrubby willows and *Potentilla fruticosa*, the valley of the Cimarron River, western Colorado, 29 Aug, 1896. Plant with much the aspect of *V. villosa*, but the leaves relatively broader and quite reniform; not intimately related to that species, and apparently very distinct from all forms of the *cucullata* group.

V. COGNATA. Glabrous; leaves herbaceous and slightly fleshy, the lower occasionally subreniform, more usually round-cordate and very obtuse, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, on petioles of 2 inches, the later cordate, cucullate when young or perhaps permanently so, all crenate and obtuse or obtusish: peduncles very slender, 2 to 4 inches long, and equaling or surpassing the leaves: corollas large, light blue, all the petals villous at base, the three lower very strongly so: peduncles of later apetalous flowers filiform, erect or ascending, the mature fruits from these not known.

Common in wet meadows of the northern Rocky Mountain region and westward; embracing much if not all of the so-called *V. cucullata* and *obliqua* of far-western subalpine districts. I name it in allusion to its manifest affinity for the common large wet-meadow violet of the East, which, in this paper, I half-heartedly denominate *V. cucullata*. It may be either the parent or the offspring of that; but it is at least a good geographic and climatic subspecies, well enough marked by its small size, very slender rootstock, smaller leaves of broader and more rounded general outline, and by its very villous petals. In its late summer development I do not yet know it.

# Studies in the Compositæ.—IV.

## OREASTRUM.

Acaulescent perennials, with narrow subcoriaceous entire leaves and scapiform monocephalous branches from a stout somewhat fusiform and not freely branching tap-root. Bracts of the involucre narrow, subequal, in about 2 series. Rays rather numerous, elongated, purple. Disk-corollas tubular-funnelform, 5-toothed and the teeth erect. Style-branches filiform to subulate-linear, strongly hirsutulous. Achenes subterete, distinctly 5 to 8-costate. Pappus a single series of brownish barbellate-scabrous and rather fragile or deciduous bristles.

The two or three species of far-western subalpine plants here received in the rank of a genus are related to *Aster* somewhat less intimately than are their Atlantic American analogues, the species of *Heleastrum*. Their type-species, when new to botanists, was not at all thought of as a possible *Aster;* and Dr. Gray published it as an *Aplopappus;* its aspect being so completely that of *Pyrrocoma* that the author seems to have had no doubt that its rays, when known in the fresh state, would prove to be yellow. And now that all authorities have found themselves forced to admit yellow-rayed and purple-rayed species of astereous plants within the limits of a genus, I have been for several years hesitant between the two alternatives of referring the present type to *Pyrrocoma*, where Gray at first placed it, and that of proposing for it the rank of a genus. From *Aster* it is abundantly distinct by characters of flower and fruit alone, not to mention the un-aster-like vegetative peculiarities. The disk-corollas in *Aster* are more deeply cleft and the segments

spreading. The style-tips there are not only broad but connivent; here they are long, slender and divergent. The achenes in *Oreastrum* are scarcely compressed, and really ribbed, not merely striate as they have been said to be.

1. O. ALPIGENUM. *Aplopappus alpigenus*, Torr. & Gray, Fl. ii. 241. *Aster alpigenus*, Gray, Proc. Am. Acad. viii. 389. *Aster pulchellus*, Eaton, Bot. King, 143, t. 16, according to Gray, yet perhaps this may prove specifically distinct.

2. O. ANDERSONII. *Erigeron Andersonii*, Gray, Proc. Am. Acad. vi. 540. *Aster Andersonii*, Gray, Proc. Am. Acad. vii. 352.

3. O. ELATUM. Glabrous throughout, the scapiform branches decumbent at base, 14 to 20 inches high: radical leaves unknown, the lower cauline linear, acute, 4 to 6 inches long: heads very large, more than an inch broad, low-hemispherical; bracts of the involucre in about 3 series, the outer successively shorter, all with herbaceous triangular-subulate green upper portion, the lower half broadly linear, 3-nerved between four parallel and closely approximate whitish subcartilaginous ribs: rays deep violet: style-tips filiform: ovaries glabrous or nearly so; pappus whitish.

Collected on Mt. Dyer, in northeastern California, in young flowering state, July, 1879, by Mrs. R. M. Austin. A large plant, much resembling a large *Pyrrocoma uniflora* in some particulars; the involucre perfectly glabrous as in no other *Oreastrum*, and the species more distinct from the two preceding than they are from each other.

## LEUCELENE.

Low perennials with diffusely branching leafy stems from a slender ligneous base. Leaves numerous, subulate and appressed, or more spreading and nearly linear. Heads small, solitary and terminal upon the nearly filiform ulti-

mate branchlets. Involucres turbinate, imbricated, the bracts narrow, nearly plane, herbaceous but with narrow scarious margins. Rays and disk both white, or the former reddish or at least often turning red in drying. Disk-corollas tubular-funnelform, 5-toothed but not deeply so, style-tips ovate, acutish. Achenes long and slender, manifestly compressed, hirsutulous. Pappus a single series of long and slender scabrous bright-white bristles.

Plants of arid elevated plains and lower mountains from Colorado and Arizona southward into Mexico; flowering (like *Townsendia*) in spring and early summer. None of the earlier and more discriminating of our botanists conceived of these plants as possible members of the genus *Aster;* and the typical species, as the bibliography shows, was given a nominal place in each of several genera. Dr. Torrey in his day, and even Dr. Gray in his time, credited the plants with a double pappus, mistaking, as I suppose, some of the uppermost hairs of the achene, for a short outer pappus. But Nuttall, who studied the plant very carefully, as appears in the paper on *Eucephalus*, pronounced the pappus to be simple; and the only suggestion which I find of anything like an outer pappus is plainly an outcome of the hairiness of the achene.

Considering the great diversity of forms in which the plant appears, it is hardly satisfactory to admit but a single species.

L. ERICOIDES. *Inula ? ericoides*, Torr. Ann. Lyc. N. Y. ii. 212 (1828). *Chrysopsis ericoides*, A. Eaton, Man. 5 ed. 174 (1829). *Eucephalus ericoides*, Nutt. Trans. Am. Phil. Soc. vii. 299 (1840). *Diplopappus ericoides*, T. & G. Fl. ii. 182 (1841). The type is a northern plant, of the hilly parts of Kansas and Colorado. It is low, scarcely woody at base, the branches clothed throughout with spreading heath-like linear leaves, these glanular and also both strigose and hispidulous. This is strictly vernal in its flowering. In New

Mexico there occurs, in addition to this, a form that is later in its flowering, has only subulate and appressed leaves that are scarcely hispidulous; the stems are more decidedly suffruticose at base, and all the branches are filiform, long, weak and straggling. I wish to name this a variety or subspecies SEROTINA. I am not sure that this does not merely represent a later second flowering of the type; a condition of it such as might possibly be caused by a revival of its growth after the beginning of the summer rains. Yet, in Colorado, the summer rains superinduce no such renewed growth and second flowering in the plant of that region.

The var.? TENUIS (*A. ericæfolius*, var. *tenuis*, Gray) is much like the other variety in aspect, but has other characters such as would seem to bespeak for it the rank of a species. This has at base of stem a distinct tuft of spatulate linear leaves entirely unlike those of the filiform branches, which are subulate and appressed. The bracts of the involucre in this are of a somewhat elliptic-lanceolate outline and are far more conspicuously scarious-edged than in other forms.

Dr. Gray has erred in attributing to any of these plants "rays purple or violet." They are white, except when varying to rose-color or red. There is nothing of the violet coloring of true Asters in this genus.

Vol. III. Part 16.

# PITTONIA.

## A Series of Botanical Papers

BY

EDWARD L. GREENE,

*Professor of Botany in the Catholic University of America.*

WASHINGTON, D. C.

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# The Winter Hellebore, and Other Bibliographic Notes.

That interesting little perennial of earliest spring, known to botanists of the present as *Eranthis hyemalis*, Salisb., has a long history in books, and had to no little degree, and before Linnæus, exercised the minds of systematists as to its affinities. By some it had been placed in *Ranunculus*, by some in *Aconitum*, and by others in *Helleborus*. Linnæus was among those who were able to see in *Helleborus* its nearest affinity; accordingly, he placed it under that name, and called it *H. hyemalis*, adopting as its specific adjective one which had very early been associated with it under *Aconitum;* for it is the *Aconitum hyemale*, Camerarius, Epit. 828 (1586).

In so far as the bibliographers have shown, the plant was received by all authors after Linnæus (with the exception of Adanson), as a true *Helleborus*, until the early part of the nineteenth century, at which period three different authors, apparently strangers to one another and working independently, within the space of six years, proposed its segregation from *Helleborus* and its reception in the rank of a genus. It is the type of *Eranthis*, Salisb. (1807), of *Kœllea*, Biria (1811), and of *Robertia*, Merat (1813).

Although *Eranthis* has been received, all through the now closing century, as the name of the genus, because of its priority, still the Adansonian *Helleboroides*, being more than forty years older, would long since have displaced *Eranthis* had it not been such a name as the Linnæan code of nomenclature rules out. We can not, under Linnæus, adopt or employ any proposed generic name which is made by the

appending of *oides* to a name already in use. This most excellent rule of Linnæus has, indeed, been openly violated in several of our more recent American catalogues, and, I regret to say, in so influential a book as Dr. Britton's *Illustrated Flora* is sure to become, by the adoption of Adanson's *Juncoides* in place of the legitimate and correct name *Luzula*. We are glad of that inconsistency by which our Rochesterians have ignored *Helleboroides*, and, in defiance of their own rules, retained the forty years more recent name *Eranthis*. The retirement of so beautifully significant a name as *Eranthis* is, in any case, almost to be deplored; nevertheless under the law of priority it is inevitable; for that unappreciated, yet not incompetent botanist, John Hill, appears to have been the first of botanical authors to publish the Winter Hellebore as forming a distinct genus. And, since this was done subsequently to the year 1753, and the name has no defect by which it could be ruled out, it will be adopted by all, except such as deny the right of priority—if such there be.

Hill's description of the plant is full, and is accompanied by a very good figure; and his name for the genus is CAMMARUM; one which, as I intimated at the outset, has not been mentioned by any of our bibliographers, and is omitted doubtless through mere oversight, even from the *Index Kewensis*, except as applied somewhat recently to quite another genus. I have no practical acquaintance with any other than the type-species; and that must be called

CAMMARUM HYEMALE.

*Aconitum hyemale*, Camer. l. c. (1586).
*Helleborus hyemalis*, Linn. (1753).
*Eranthis hyemalis*, Salisb. (1807).
*Kœllea hyemalis*, Bir. (1811).
*Robertia hyemalis*, Mer. (1813).

The genus is published in the *British Herbal* (1756); page 47 of that folio being devoted to a very full account of the

type-species, and the good colored figure illustrating it is on plate 7 of that work.

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To such as disapprove *Scolopendrium Scolopendrium* as a binary name it may come as a welcome bit of information that *Scolopendrium* cannot be maintained as the generic name for this fern-type. Tournefort's genus-name for it, *Lingua Cervina*, no one would accept. Linnæus suppressed the genus, consigning the plant to *Asplenium;* and the first to assert its generic rank, at least after 1753, was Hill, who restored to it one out of several pre-Tournefortian names for it, *i. e.*, PHYLLITIS. I should therefore designate it as

PHYLLITIS SCOLOPENDRIUM.
*Asplenium Scolopendrium*, Linn. (1753).
*Phyllitis vulgaris*, Hill, Brit. Herbal, 525 (1756).
*Scolopendrium vulgare*, Smith (1793).

---

The futile endeavor, on the part of Linnæus, to merge in one genus such different plants as the cranberries and whortleberries has resulted in the usual large amount of synonymy for a small group of species. By right of priority, the name of OXYCOCCUS of Tournefort is the only one for the cranberries. But more than one eminent botanist has held to the opinion that, when once the "great Linnæus" had suppressed a genus, whoever resurrected it might give it, if he chose, an entirely new name; thus Roth, in 1788, applied a new name, *Schollera*, to OXYCOCCUS; and an American author, more than a century later, named the two American species under *Schollera*. But it is a fact which seems to have escaped the notice of all bibliographers that John Hill, only three years after 1753, restored the cranberry to generic rank, and under its rightful name, OXYCOCCUS. Hence, under the Rochester rules, the names to be employed by botanists for our two American species

are those which were assigned them by Persoon in 1805; while for the European species one has choice of two already published names, the oldest combination being *O. vulgaris*, Hill (1756); the other *O. palustris*, Pers. (1805); this last having the most complete priority as a binary name, because it unites the oldest specific name and the oldest generic; for the plant was known long before even Tournefort as *Vitisidæa palustris*, C. Bauhin.

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## New or Noteworthy Species.—XVIII.

Cardamine umbellata. Stems several, 10 to 20 inches high from slender horizontal rootstocks, erect, sparingly leafy to the summit, the herbage glabrous: all the leaves pinnate, the lowest with from 3 to 5 rounded or oval, the upper with 5 or 7 more elongated leaflets, these all entire or very sparingly toothed: flowers few, small, white, often 3 to 5 only and from corymbose to subumbellate: pods erect (on pedicels of about $\frac{1}{2}$ inch), about $\frac{3}{4}$ line wide, $\frac{3}{4}$ to 1 inch long including the prominent beak; valves not elastic; seeds about 8 or 9 under each valve, rather large.

St. Paul Island, Behring Sea, collected by Mr. James M. Macoun in 1891 and 1892. Species somewhat nearly allied to the Californian *C. Breweri*. A plant very similar to this, and no doubt specifically identical, was collected in 1852, by Mr. Funston, at Khantaak Island, Alaska; but the leaves of this are sparingly hispid-ciliolate, a character of which there are obscure traces in some of Mr. Macoun's specimens.

Cardamine neglecta. Slender, glabrous, the simple upright stem 4 to 7 inches high, from a small ovoid or oblong perpendicular not deep-seated tuber: basal leaves 1 to 3, with small orbicular lamina and elongated petiole; cauline leaves 2 to 4, lyrate, with 1 or 2 pairs of lateral leaflets of rounded or oblong outline, entire, 2 to 4 lines long, and a

terminal rounded or obovoid one thrice as large, repandly or more deeply and coarsely toothed; flowers few, small, white, the obovate-spatulate petals not 2 lines long, but twice the length of the sepals: pods (immature) narrowly linear, beakless.

Shores of the Behm Canal, in southern Alaska, 24 June, 1892, M. W. Gorman. Species strongly marked by its oblong upright tuber, resting almost on the surface of mats of wet moss.

CARDAMINE FULCRATA. Stems suffrutescent at base, from a horizontal not deep-seated and somewhat ligneous root-stock, leafy throughout, and glabrous: leaves ample, trifoliolate, long-petioled, the terminal leaflet oblong-ovate, coarsely crenate-serrate, acute or acuminate, petiolulate, the lateral ones unequal at base and sessile: raceme loose, few-flowered, leafy and leafy-bracted to the summit: pods large, linear, subulate-beaked: flowers rather small, white.

In deep woods at 9,000 feet on the mountains of Oaxaca, Mexico, 1894, C. G. Pringle. An exceedingly peculiar *Cardamine*, on account of its suffrutescent habit and leafy inflorescence, but distributed as *C. angulata*.

ARABIS RHODANTHA. Biennial, stoutish, simple, erect, 1 or 2 feet high, stellate-tomentulose even to the calyx and ovary, but the rachis of the long raceme alone nearly glabrous: lowest leaves cuneate-oblanceolate, few-toothed above the middle: cauline linear, acutish, sessile by an abruptly somewhat dilated and obtusely auricled base: raceme elongated and very narrow, the pedicels deflexed and subsecund even in flower: petals of the small pendulous flowers strictly erect, little surpassing the sepals and of a deep rose-red: anthers oblong: pods deflexed, straight, long and narrow, acutish: seeds in one row, narrowly wing-margined.

A beautiful species, collected by the writer, at about the limit of trees, in the mountains of middle Colorado, in 1875, and not detected since. Readily distinguishable from *A.*

*Holböllii* by its obtusely auricled cauline leaves, and toothed radical ones, as well as by its excessively elongated racemes of much smaller red flowers.

ARABIS FENDLERI. More slender than the above and less tall, mostly or wholly destitute of stellate hairs, only the lowest entire oblanceolate leaves very distinctly hirsute-ciliate, and with scattered trifurcated hairs on the lower face, all the upper parts of the plant, including all but the lower cauline leaves, glabrous and glaucous; the sessile cauline leaves barely auricled, not sagittate: pods mostly less than 2 inches long, scarcely curved, acutish, on spreading or scarcely deflexed pedicels of $\frac{1}{2}$ inch or more: seeds in 2 rows, small, marginless.

A somewhat variable plant of subalpine situations in the Rocky Mountains from New Mexico to Wyoming; but in none of its phases does it exhibit the pubescence of *A. Holböllii*, but always its own, which is chiefly conspicuous as a ciliation of the leaf-margin. The description is here drawn mainly from Colorado specimens of my own collecting, which exactly match Fendler's n. 27 from New Mexico, which is the type of Mr. Watson's *A. Holböllii Fendleri*, in Gray, Syn. Fl. i. 164.

LEPIDIUM RETICULATUM, Howell, Fl. N. W. Am. 64. Low and diffuse; herbage light-green, more or less hispid-puberulent: the numerous branches usually 2 to 4 inches long and divaricate, the narrow and dense fruiting racemes very many and conspicuous, the very earliest reduced to capitate sessile clusters among the radical leaves: leaves of oblong outline, pinnatifid, the segments 3-cleft or -toothed: petals none: pods of ovoid or broadly elliptic outline, little more than a line long, wingless, obtusely 2-toothed at summit, glabrous, reticulate; pedicels short, ascending or spreading, not much flattened.

This is the *Lepidium Menziesii* of Nuttall, of Watson, Asa Gray and myself; Nuttall's mistaken identification of it with

*L. Menziesii* of De Candolle having been adopted successively by all those authors. My own comments on its behavior in California, published in *Erythea* in 1893, and suggesting the possibility of its being a foreigner, seem to have convinced Mrs. Brandegee and Dr. Robinson (Zoe, iv. 300, and Gray, Syn. Fl. i. 128) that it ought to be excluded from our catalogue of native species; and they claim to have identified it with the South American *L. bipinnatifidum.* This did not improve matters in the least; for our plant has two strong peculiarities, either one of which militates effectually against its being received as *L. bipinnatifidum.* They are as different in habit and inflorescence as two species of the same genus can well be. This alone should enable any competent botanist to distinguish them specifically, if he has but once compared the two plants. But the pods of the S. American species are perfectly smooth, of the N. American distinctly reticulate-venulose.

Mr. Howell's description, drawn from very dwarf and almost branchless specimens, is inadequate to the identification of the species in its normal state.

SIDALCEA VALIDA. Perennial, erect, stout and somewhat fistulous, 4–6 feet high, the stem and long petioles of lower leaves loosely and almost hispidly pubescent with simple slightly deflexed hairs; the foliage roughish on both faces with short ascending geminate divergent hairs: lowest leaves on petioles 8–12 inches long, orbicular with closed sinus, the margin slightly lobed and coarsely toothed; the middle and upper cauline deeply parted into cuneate-obovate or narrower segments with open sinuses: inflorescence in many short panicled spikes: petals ¾ inch long, rose-purple, retuse: fruiting calyx depressed globose, the segments ovate-deltoid, the whole stellate-tomentose: carpels smooth and glabrous, not depressed, strongly beaked.

In wet meadows of Knight's Valley, Sonoma County, California. Collected by the writer in 1894. Species much like

*S. Oregona* in size and habit, but very dissimilar as to pubescence, foliage, and characters of calyx and carpels.

SIDALCEA SCABRA. Perennial, tufted, the slender and simple stems a foot long and more, decumbent or assurgent: herbage appearing almost glabrous, but rough to the touch with a short geminate or somewhat stellate pubescence: leaves on long and slender petioles, all much alike, both radical and cauline semiorbicular, about 7-lobed, the lobes from short and quadrate to subcuneate, and crenately 3-lobed at summit, the sinuses open: flowers large, rose-purple, in a simple and loose raceme: calyx very deeply cleft; segments lanceolate, acuminate: carpels not known.

Common in moist clayey subsaline soil about the hot springs at Byron, California. A plant so much resembling the common *S. malvæflora* of the seaboard, in mode of growth and size of corolla, that its very good characters as a species have until now been overlooked. The semiorbicular outline and peculiar cut of the leaves, the scarcely visible but easily felt rough pubescence, and the deeply cleft calyx are very characteristic.

SIDALCEA ASPLENIFOLIA. Stout and tall, apparently 4 or 5 feet high, the stem with a few scattered stellate hairs, the petioles of the very large leaves 6 or 8 inches long, retrorsely short-hirsute with mostly geminate hairs: lowest leaves 4 inches wide, rounded and merely lobed or cleft, the middle cauline much larger (often 8 or 10 inches broad), usually completely divided into 5 or 7 lanceolate leaflets, these coarsely serrate-pinnatifid; the upper cauline parted into more cuneiform segments 3-lobed at summit: panicled racemes in fruit a foot long or more, sparsely stellate-hispid: corolla pink, barely $\frac{1}{2}$ inch long: segments of the stellate-tomentose calyx ovate-lanceolate, longer than the tube: carpels not known.

Collected near Seattle, Washington, July, 1891, by Mr. C. V. Piper.

SIDALCEA REPTANS. Stems slender, simple, 2 feet high or more, several from a tap-root, but all decumbent at base and rooting at the nodes, the leaves mostly from the basal horizontal part of the stem, small, but on greatly elongated very hirsute petioles, the lamina scarcely 2 inches broad, orbicular, the sinus nearly closed, the margin deeply and coarsely crenate, or lobed, the teeth or lobes obtuse, mucronate: inflorescence simple, loosely spicate, stellate-tomentose: calyx-segments triangular-lanceolate: corolla nearly an inch long, deep rose-purple: carpels not depressed, beaked, strongly favose-reticulate on the back.

In marshy ground, Panther Creek, Amador County, California, 1892, Geo. Hansen.

LUPINUS FULCRATUS. Perennial, erect, the stems slender and rather brittle, 2 or 3 feet high, branching above, the stem and branches clothed scantily with a soft and wholly spreading pubescence, the leaves somewhat villous: stipules of all except the lowest cauline leaves wholly herbaceous and leaf-like, oblanceolate or lanceolate, 3 lines long or more and spreading: leaflets 7 to 9, cuneate-oblong, obtuse, 1 inch long or less, on petioles not much longer: flowers indistinctly whorled, in lax subsessile racemes: calyx hirsutulous, gibbous at base but hardly saccate: corolla only 4 or 5 lines long, dark-purple, the banner shorter than the other petals: keel slenderly falcate, naked: pods apparently small, densely hirsute.

Fresno Co., California, at considerable elevations in the mountains; collected in 1890, by Mrs. L. A. Peckinpah. Species easily distinguished from all its allies by its wholly herbaceous and therefore unusually conspicuous stipules.

LUPINUS ELMERI. *L. silvestris*, Elmer Drew, Bull. Torr. Club, xvi. 156 (1889), not of Lamarck (1778). In the *Flora Franciscana* I placed this as a variety of *L. albicaulis;* but

that I am now convinced was wrong. The species is intermediate between *L. albicaulis* and *L. fulcratus*, but has the usual scarious stipules.

LUPINUS MAGNUS. *L. polyphyllus*, Greene, Fl. Fr. 40, and Man. 105, as to the description, and plant of the middle Californian seaboard, not of Lindley. It is not necessary to reproduce here the full description given by me in the places cited. Specimens from Douglas' original station, as well as Mr. Howell's manuscript notes on the plant of far northern localities, convince me that this is wholly distinct from the true *L. polyphyllus*.

LUPINUS GRATUS. Stems numerous, closely tufted on a ligneous base wholly above ground, erect, 2 feet high, leafy up to the solitary rather short and dense scarcely peduncled raceme; the whole herbage cinereously puberulent, and destitute of other hairiness: lowest leaves on petioles 6 to 10 inches long, the stalks of the upper only about 2 inches long: leaflets 7 or 9, oblanceolate, abruptly acutish; stipules of all the leaves subulate-filiform: flowers small, verticillate, but the whorls closely approximate: calyx saccate: corolla less than $\frac{1}{2}$ inch long; petals about equal; keel rather short, not even the apex exserted, woolly-ciliate from base to above the middle.

Pine woods of Lassen Co., Calif., on the northward slope of the Dixey Mountains, July, 1894, Messrs. Baker & Nutting. The species is one of excellent characters, and the flowers are said to be exceedingly fragrant.

SOLIDAGO RACEMOSA. Stems usually clustered, always erect and slender, 1 to 2 feet high, leafy, but the leaves diminishing towards the inflorescence, the herbage glabrous, not even the involucres at all glutinous or viscid: leaves all oblanceolate, mostly narrowly so, the larger indistinctly serrate, of firm texture: heads rather large, ordinarily in a loose raceme 4 to 6 inches long, the pedicels $\frac{1}{2}$ to $\frac{3}{4}$ inch long and

notably small-bracted : bracts of the involucre in 3 or 4 series, all narrow and obtuse, the inner and longer ones with a distinct mid-nerve and thin-hyaline margins, only the tips herbaceous throughout : achenes long, slender, distinctly clavate, constricted at summit under the pappus and very definitely 15-striate, canescent with a rather closely appressed pubescence : pappus very bright white, fine and fragile.

This is the southern plant referred by Gray to *S. humilis*, and forming a part of Prof. Porter's *S. Purshii*. But the excellent characters of the loose open racemose inflorescence, the half-hyaline and completely glandless involucral bracts, and particularly those of the clavellate 15-striate achene, are very decisive of its specific rank. The true *S. Purshii* has altogether another sort of inflorescence, an achene more turbinate than clavate, with ten ribs instead of fifteen fine striæ, and with a pubescence less dense, and that hirtellous rather than silky. This diagnosis is drawn from beautiful and thoroughly mature specimens collected last autumn, near the Great Falls of the Potomac, by Mr. D. Le Roy Topping.

SOLIDAGO DECUMBENS. Stems clustered about the summit of a strong perpendicular root, stout, decumbent, from a few inches to more than a foot high, usually dark red, sparsely puberulent, as is also the foliage : lowest leaves from spatulate-obovate to oblanceolate, obtuse or acutish, more or less distinctly serrate toward the summit, upper cauline leaves similar, but few and reduced, all scabrous on the margin : inflorescence interruptedly thyrsoid : heads large ; bracts of involucre somewhat glandular-viscid, linear, obtusish, of firm texture and carinate-nerved, forming about 3 series, the outer and shorter rather subulate-linear than linear : achenes subcylindric, but with 5 rather prominent angles and as many intervening striæ, loosely strigose-hispidulous ; pappus very strongly barbellate scabrous.

Very common species of the Rocky Mountains of Colorado and northward, in subalpine and alpine situations, but occu-

pying dry slopes or summits; forming the greater part of Gray's *S. humilis*, var. *nana*, but thoroughly distinct from that plant of the East Canadian coast and islands which is typical *S. humilis*, Pursh, now received under the more safe name of *S. Purshii*, Porter. Of *S. decumbens* the nearest relative is *S. ciliosa* of Arizona, published at page 22 of this volume.

Eucephalus Covillei. Tufted stems more than a foot high, somewhat flexuous, racemose-corymbose from near the middle, these and the lower face of the leaves sparingly tomentulose: leaves oblong-lanceolate, acute, entire: bracts of the narrowly campanulate involucre granular-puberulent, well imbricated, herbaceous and scarcely carinate, lanceolate and oblong-lanceolate: rays few (5–7), long and narrow, deep violet.

Near Crater Lake, Oregon; collected in 1896 by Mr. Coville.

Erigeron Macounii. Low perennial, with a stout branching caudex bearing many spatulate linear acute entire leaves, and stoutish ascending sparsely leafy monocephalous peduncles; the younger foliage canescently strigose, the older glabrate: heads large, hemispherical; bracts of the somewhat hoary-tomentose involucre subequal, in 2 series: rays about 50, rather broad, purple.

Sheep Mountain, Waterton Lake, Alberta, 28 July, 1895, Mr. John Macoun. A beautiful species, allied to *E. lanatus* and *E. grandiflorus*, but in foliage and pubescence quite distinct from either.

Erigeron fraternus. Stems several from a short branching rootstock, erect from a slightly decumbent base, stoutish and striate-angled, a foot or two high, copiously leafy below, rather amply corymbose-panicled at summit; herbage green but very scabrous, the peduncles and upper part of stem more densely and finely scabrous-pubescent: leaves from

spatulate-ovate to lanceolate, 2 to 8 inches long including the petiole, acute, remotely serrate though often obscurely so; cauline leaves few, reduced, lanceolate and sessile: hemispherical involucres $\frac{1}{2}$ inch high and rather broader, usually 12 or more in the corymb; bracts of involucre very narrow, equal, acuminate, sparsely hispidulous: rays extremely narrow and numerous, rather more than $\frac{1}{2}$ inch long, white, changing to deep pink; pappus simple, its slender bristles only about 16 or 18; achenes sparsely strigulose under a strong lens.

Species, strikingly analogous to *E. Philadelphicus* in habit and inflorescence. Detected by the author in moist meadows of the Gunnison River, Colorado, 1 Sept., 1896.

ERIGERON ELATIOR *E. grandiflorus*, var. *elatior*, Gray. Stems somewhat clustered, stout, erect, 2 feet high, leafy up to the monocephalous, or usually distinctly corymbose summit, hirsute-pubescent, the foliage scabrous: leaves ovate-lanceolate, acute, entire: heads 1 to 8, on bracted peduncles; involucres very large, often more than $\frac{1}{2}$ inch high and $\frac{3}{4}$ inch broad, its linear attenuate-acuminate bracts squarrose-spreading, embedded in dense soft wool: rays showy, numerous and narrow: achenes pubescent; pappus of rather firm bristles and a conspicuous outer circle of white squamellæ.

Mountains of Colorado, at from 8,000 to 9,000 feet. Species not at all related to *E. grandiflorus*, nor even analogous to it except in the woolliness of the involucre; more truly allied to *E. macranthus*.

ERIGERON CERVINUS. Stems slender, 8 to 12 inches high from stout ascending rootstocks, leafy at base, the whole herbage glabrous, only the peduncles and involucres glandular and slightly puberulent: leaves all very thin, entire, the lowest with obovate blade less than an inch long, and slender petiole of 2 inches or more; the few and remote cauline oblanceolate or narrowly spatulate and sessile: heads

mostly 2 or 3, slender-peduncled; involucre about 3 lines high and 4 or 5 broad, the bracts equal, broad, not numerous, attenuate-acuminate: rays 25 or 30, broad and rather short, white.

Deer Creek Mountains, Josephine Co., Oregon, July, 1887, Mr. Howell; evidently subalpine and of moist if not marshy ground. Species singularly combining the characters of *Aster andinus* and *Erigeron salsuginosus*; and about as naturally referable to *Aster* as to *Erigeron*.

ERIGERON ELATUS. *E. alpinus*, var. *elatus*, Hook. Fl. ii. 18. Stems several, erect, from a perennial root, 6 to 18 inches high, striate-angled, reddish and hirsutulous, only sparingly leafy except at base, bearing at summit either a solitary rather large head, or 3 to 5, which are slender-peduncled and subcorymbose: lowest leaves from small and obovate with slender petiole, to narrowly and spatulately oblanceolate, obtuse, entire, glabrous beneath, above sparsely strigose, distinctly hirsute-ciliate, at least below the middle; the cauline linear-lanceolate to linear, sessile, acute: involucres 4 or 5 lines high and 6 in breadth, bracts linear-acuminate, almost hispidly short-hirsute, not glandular, unequal, the outer little more than half the length of the inner: rays very numerous, elongated and manifestly spreading, bright pink or red-purple: pappus white, rather copious, somewhat accrescent.

Var. BAKERI. Plant larger, glandular and viscid, destitute of other indument, except that the leaf margins are hispid-ciliolate: rays apparently fewer and broader, perhaps not spreading.

The type of this species, which is decidedly a handsome one for a member of the *E. acris* group, seems to be common in the mountains of British Columbia, where Mr. Macoun has repeatedly collected it. The variety is subalpine in the mountains of northern Colorado, having been collected at and near Cameron Pass, in 1896, by Mr. Carl F. Baker.

ERIGERON KINDBERGI. Stems several, erect, from a perennial root, 6 inches high, pilose-pubescent, apparently flaccid and not conspicuously angled: lowest leaves oblanceolate, entire, acute, wholly glabrous and in no degree ciliate; the cauline narrowly linear, elongated, sessile by an abruptly dilated base: heads mostly solitary, small, the involucre barely 3 lines high; bracts very unequal, all narrowly linear and rather abruptly acute, glabrous and glandless except at the pilose-pubescent base: rays very numerous, narrow and short: pappus scanty for the *E. acris* group, and not at all accrescent, dull-white, unchanged in age.

Plateau east of Stump Lake, British Columbia, in wet meadows, J. McEvoy, 1891; communicated by Mr. Macoun; some of the characters indicated to him in manuscript by Mr. Kindberg.

ERIGERON JUCUNDUS. Perennial, 2 to 10 inches high, the several stems monocephalous, or, in larger plants, with several and corymbose-racemose rather large heads; herbage light-green and flaccid, more or less pilose-pubescent, and at least the upper parts of the plant glandular-viscid: lowest leaves spatulate-obovate and oblanceolate, obtuse, mucronulate, entire or with one or two pairs of crenate and mucronulate teeth below the apex, both faces sparsely pubescent and the petioles as sparsely ciliate; the cauline oblong-lanceolate, entire: heads 3 or 4 lines high, but involucral bracts notably shorter than the flowers, unequal, nearly linear, the inner acuminate, the tips of all more or less spreading, the whole involucre as well as the peduncles viscid-glandular, the basal parts hirsute-pubescent: rays apparently 60 to 80, not extremely narrow: pappus copious and accrescent, dull white, little darker in age.

A well defined species, though of the difficult group of *E. acris*, long known from Dr. Richardson's collection only, but rediscovered by Mr. Macoun in eastern British Columbia,

namely at Kicking Horse Lake in 1890, and at Cave Avenue, Bauff, in 1891. Easily distinguished from *E. Dræbachensis*, to which Mr. Macoun referred it, by its very different habit, pubescence and inflorescence; and the pappus of the latter, at least in the American plant, becomes of a rich and beautiful brown-red in age. The peduncles in the present species, though slender, are abruptly and conspicuously enlarged at summit under the involucre.

ERIGERON PEREGRINUS. *Aster peregrinus*, Pursh, Fl. ii. 556. This plant is so exceedingly near the common and widely dispersed *Erigiron salsuginosus* that they are always mixed in the herbaria, and sometimes by authors as well. Mr. Howell is the only recent collector of the species whose specimens have gone out to his correspondents correctly named—as according to Pursh, Gray and others. In the herbarium of the Canadian Survey there are occasionally mounted on the same sheet and under the same label this plant and *E. salsuginosus;* and in the good Alaskan collection made by Mr. Funston, and distributed from the U. S. Museum, Mr. Coville has wholly mistaken it for that species. It is a thoroughly distinct species, recognizable at a glance by the eye of the critical; yet, if *E. salsuginosus* is not to be received as an *Aster*, no more is this. There are, indeed, objections to the referring of either species to either *Erigeron* or *Aster;* but where one goes the other should.

Var. DAWSONI. Differs from the type in having its leaves gradually reduced from the middle of the stem upwards, almost as much so as in *E. salsuginosus;* and more notably different in having twice as many and much more slender involucral bracts, and about 50 rather narrow rays.

The only specimen seen is in the Canadian Survey collection, and was obtained by Mr. Dawson on the Queen Charlotte Islands in 1877. It may easily prove a species, when better known.

MADIA DENSIFOLIA. Annual, 3 to 5 feet high, the stem almost naked above and corymbose-panicled, very densely leafy at and near the base, the leaves all narrowly linear and entire, with strong midvein and no lateral nerves, 4 to 8 inches long, densely short-hirsute, not at all glandular; the reduced and scattered rameal leaves sparsely bristly-ciliate, the hairs longer than the width of the leaf, all the upper branches and foliage abundantly glandular: rays ample, often red at base: achenes compressed-trigonous.

Species common in western California, and long mistaken by authors for *M. elegans*, which is a plant of very different aspect, its stem loosely clothed with broadly lanceolate 3-nerved leaves, etc.

MADIA TENELLA. Annual, erect, very slender, 8 to 12 inches high; sparsely short-pubescent, the peduncles and involucres glandular: lowest leaves opposite, upper alternate, all narrowly linear, entire, obtuse, bristly-ciliate below the middle: heads few, small, solitary or subracemose: bracts of the involucre 5 to 7, with short and broad tips; rays as many, $\frac{1}{4}$ inch long, golden-yellow, their achenes little compressed and trigonous, not enclosed, but only the dorsal portion embraced, by the involucral bracts; chaff of receptacle distinct, in one series between disk and ray; the receptacle convex and somewhat hirsute.

Collected at Bear Valley, San Bernardino Co., California, June, 1894, by Mr. Parish, and distributed as *M. elegans*; but a distinct and very peculiar species in the character of its involucre and achenes.

MADIA POLYCARPHA. Annual, slender, 2 feet high, very leafy below, more naked above and corymbosely panicled: herbage appressed-strigulose, minutely glandular, and with some setose-hispid hairs: lowest leaves in pairs, oblanceolate, obtuse, entire, hispid-ciliate below the middle, the reduced ones of the branches linear, hispid-ciliate throughout: bracts

of the involucre not glandular, only sparingly hirsute: rays 8 or 10, yellow; chaff of the receptacle scarious, disconnected and in several series: ray-achenes compressed-trigonous, nearly enclosed by their bracts; central convex portion of the receptacle rather strongly fimbriate-hirsute.

Foothills of the Sierra Nevada, California.

Blepharipappus Neo-Mexicanus. *Layia Neo-Mexicana*, Gray, Pl. Wright, ii. 98 (1853). This plant, which Dr. Gray did well in distinguishing from the far-northwestern *B. glandulosus*, he afterwards reduced to the species last-named. But all the characters originally attributed to the southeastern plant hold good; and there are others not yet indicated. The plant is of a different mode of growth, never appearing diffusely branched, but always with a simple stem which bears at summit one or more peduncled large heads; the ray-corollas being of more than twice the size of those of *B. glandulosus*.

Blepharipappus nudatus. Freely branching from the base, the branches slender, sparsely leafy, 6 to 12 inches high; all the leaves, both of the radical rosulate tuft and of the branches, oblong-lanceolate and quite entire, scabrous, especially on the margins, but these and all other parts of the plant devoid of the usual glands: heads small; rays white, rather short and inconspicuous; disk-corollas bristly-hairy at summit: achenes with scattered and very closely appressed hairs: pappus of about 10 stout scabrous white awns (hardly to be called paleæ) two-thirds as long as the achene, their basal villous hairs copious and elongated, only a third shorter than the awns themselves.

Mountains of the upper part of the peninsula of Lower California, C. R. Orcutt, 1884; mistakenly distributed for *B. glandulosus*.

Chænactis floribunda. Annual, erect, 8 to 12 inches high, compactly and fastigiately branched from the base,

sparingly leafy throughout and abundantly floriferous; herbage canescently tomentulose, the short pedicels and involucres viscidulous: leaves pinnately parted into few and remote linear entire or cleft segments: heads 4 or 5 lines high: corollas all equal, dull-white: achenes slender, terete, pale, densely hispidulous: pappus of 4 lanceolate acuminate paleæ as long as the corolla, with minute rudiments of 1 or 2 exterior ones.

Common in the West Humboldt Mountains, Nevada, where it was collected by the author in 1894. A very profuse-flowering but homely species.

SENECIO MACOUNII. Tufted and apparently somewhat stoloniferous perennial, the slender nearly naked stems about a foot high, simple, subcorymbose at summit, leafy below, floccose-tomentose throughout: leaves chiefly at and near the base of the stem, hoary-tomentose beneath, more deciduously so above, 3 to 6 inches long including the slender petiole, this much longer than the obovate or oblong-lanceolate or oblanceolate blade, which is 3-nerved and with variously crenate, or dentate or repand-denticulate margin; heads small (as in *S. Fendleri*), in a rather compact cymose corymb: bracts of the involucre about 12 or 15, lanceolate, thinnish: rays as many, yellow: achenes light-colored, 5-angled, with 5 intervening striæ; pappus fine and soft.

Mt. Benson, Vancouver Island, 1893, Mr. John Macoun.

SENECIO LUGENS, Richardson, Appx. Frankl. 19 & 20. With this subarctic species a very considerable number of different plants have been confused by recent American botanists; species occupying various regions all the way between subarctic America and Mexico. Two such, belonging to our western mountains exclusively, namely *S. atratus* and *S. sphærocephalus*, were segregated by me, and defined at pages 105 and 106 of this volume; and in the working out of those species I had reached the conclusion that nothing

properly referable to *S. lugens* is known to occur upon United States territory, or even very near our borders. Since then I have been favored by the Messrs. Macoun with a very useful series of specimens collected at and near the original far-northern locality of *S. lugens*, one of the sheets containing a couple of duplicates collected by Richardson himself; and the evidence is even more full than I had anticipated, to the point that true *S. lugens* is strictly subarctic, not reaching even the mountain districts of the Northwestern States. Chief among the errors which seem to have misled authors as to the identity of *S. lugens* is that of Sir William Hooker, who figured for that species, in his *Flora Boreali-Americana*, a plant which is far enough from answering Richardson's very full and satisfactory description.

The habitat of *S. lugens*, as shown by the Canadian Geological Survey collections, is the interior of British America from about Great Slave Lake and its tributary rivers northward to the coast of the Arctic Sea; some taller plants with thinner and more glabrous herbage, as well as a more lax inflorescence, and narrower involucral bracts, possibly referable here, and also possibly representing quite another species, are from as far southward as the "Bow River Pass, Rocky Mts.," collected by Mr. Macoun in 1879, and at "Kananaskis, Rocky Mts.," by the same, in 1885. But the plant figured by Hooker under this name is very different from these, and is common in southern British Columbia, as also in certain parts of Washington and Idaho, Oregon and even northern California. This forms a part, and only a part, of Gray's *S. lugens foliosus*. It may be named and distinguished as follows:

Senecio Columbianus. Taller and stouter than *S. lugens*, often 3 feet high, the stems solitary, not clustered, and without a rootstock, but proceeding from a not at all deep-seated fascicle of fibrous roots: leaves scattered up and down the lower half of the stem (not clustered at base of a nearly

naked stem): pubescence scanty, curled-hairy rather than fine and lanate or tomentose: heads 3 or 4 times as large as in *S. lugens*, more than twice as numerous, and the corymb compound; bracts of the involucre more thick and fleshy, scarcely black-tipped: mature achenes light-colored, scarcely angled or even striate.

A variable species, as to breadth and dentation of foliage, but otherwise of constant characters, especially as to root, heads and inflorescence. Specimens quite agreeing with Hooker's figure are common in herbaria, from the region already indicated; sheets of Dawson's collecting in British Columbia in 1888 seem typical, but others from adjacent U. S. territory are as good; often labeled as if taken for *S. exaltatus*, Nutt., which is again very different by its long and long-petioled thin leaves, far smaller and much more numerous heads, etc., as Nuttall himself indicated.

SENECIO PETROPHILUS. *S. petræus*, Klatt. in Abh. Naturf. Ges. Halle. xv. 330 (1882), not of Boissier & Reuter, Pugill. Plant. Nov. 59 (1852). It is apparent that Klatt's specific name for this fine species of the higher Rocky Mountains must subside, since it belongs by thirty years of priority to a Senecio of the Old World.

GERANIUM LANGLOISII. Annual, erect, slender, 1 or 2 feet high, branched at summit only, and somewhat dichotomously, the growing parts canescent with white hairs, these deflexed on the stem, but on the foliage scattered and appressed, gland-tipped hairs wholly wanting, but the inflorescence minutely granular: leaves of rounded outline, with cuneate basal sinus and 7-parted, the segments subdivided into oblong abruptly acute lobes and teeth: petals small, rose-color, cuneate-oblong, obtuse or acutish, or rarely truncate, about 2 lines long and scarcely equalling the sepals: seeds dark brown, short-ovoid or almost spherical, delicately but quite distinctly reticulate.

A common weed in gardens and waste lands at St. Martinsville, Louisiana, where it is collected by Rev. Father Langlois, and has been distributed by him as *G. Carolinianum;* but that species has a different mode of growth, a gland-tipped and viscid spreading pubescence, and twice broader pale petals which are emarginate or obcordate.

GEUM SERICEUM. Stems slender, nearly naked and pedunculiform, erect, 8 to 16 inches high, and, with the tufted leaves, arising from a stout branching and subligneous caudex, this horizontal or ascending and clothed with the dry remains of the foliage of other seasons: tufted leaves 3 to 5 inches long, suberect, cinereously appressed-silky on both faces, the cuneate trifid or quadrifid leaflets ½ to ¾ inch long, crowded and sessile; the few bracts of the peduncle or stem sessile, pinnatifid; pedicels and broadly turbinate calyx-tube finely tomentulose: the almost orbicular petals very large, the expanded deep-yellow corolla an inch broad or more.

Alpine summits of the Ruby Mountains, Nevada, 20 July, 1896.

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## STUDIES IN THE COMPOSITÆ.—V.

### 1. *Certain species of* ANTENNARIA.

The most prevalent diœcious cud-weed of the pastures and meadows of eastern North America seems to have remained until now almost unnoticed by botanical writers, and entirely without a name of its own; the plant having been almost universally either confused with, or mistaken for, *Antennaria plantaginifolia.* Before presenting a statement of the characters of this most common and singularly neglected weed, it will be needful to give—what, indeed, has never yet been given by any author—a fair diagnosis of the true plantain-leaved species.

A. PLANTAGINIFOLIA. Stem a foot high or more, stoutish: stolons short, stout, ascending, leafy throughout: leaves with fairly distinct blade and petiole, the former ovate or obovate, mucronate, conspicuously 3-nerved: receptacle of pistillate flowers hemispherical: styles little exserted, deeply cleft: achenes linear, slightly curved, nearly destitute of papillæ: dilatation of pappus-bristles in male flowers strong and abrupt.

In contrast with this, the long neglected species offers characters as follows:

A. NEGLECTA. Stems seldom a foot high, slender: stolons nearly filiform, elongated, closely prostrate, minutely bracted, but properly leafy only terminally: leaves without distinction of blade and petiole, narrowly spatulate, 1-nerved, without trace of lateral nerves, their texture firmer than in the above: receptacle of pistillate flowers distinctly conical: styles long-exserted, the branches very short: achenes oblong-fusiform, straight, copiously papillose: dilatation of pappus in male flowers slight and gradual.

Both the above species are very common plants in the neighborhood of Washington; the former occurring in great abundance in open woodlands and on bushy hills; the latter chiefly in meadows and pastures. In aspect they are so different that it is impossible a botanist, seeing the two growing side by side, should fail to perceive them totally distinct. I have given above no more than what may be called the essential characters of the species. There are several other notable differences between them. *A. plantaginifolia* is fully three weeks later in its flowering than *A. neglecta*. The low staminate plants (always short-stemmed), in both species, are so much earlier in their flowering than the female plants that one can scarcely doubt both species are parthenogenetic. Male plants of *A. plantaginifolia* are scarce. One may traverse acres of the female plant in full flower without being able to detect a single patch of the male. In *A. ne-*

*glecta* not so, the males being nearly as common as the females. Yet even here the male flowers are dead and gone, for the most part, before the pistils of the other plant are exposed.

No critical inspection of the foundations of *Gnaphalium plantaginifolium*, Linn., can leave any doubt as to which of these species that author had in view, under that name; and there is no intimation that *A. neglecta*, common as it is all over the oldest parts of the botanical field of this country, was known to him.

That several botanists, knowing these two plants familiarly, were obliged to indicate them as distinct appears from several old and almost forgotten editions of once popular manuals. But all these authors erred in supposing what is here described as new to be the Old World *A. dioica*.[1]

Two far-western allies of these species may here be characterized, both of which have been received by some botanists and distributed to various herbaria as "*A. plantaginifolia*."

A. Howellii. Tall, and with the large heads of *A. plantaginifolia*, but with the slender prostrate stolons and subcoriaceous glabrate leaves of *A. neglecta*, but those last narrowly cuneate-obovate rather than spatulate, wholly glabrous above, and not indistinctly feather-veined, with also a long lateral nerve near each margin, these and the pinnate veinlets, as also even the midnerve, evanescent toward the apex of the leaf: white tips of the inner involucral bracts narrowly lanceolate and very acute: achenes rather short, papillose-granular.

Mt. St. Helen, Oregon, 1887, Thomas Howell. A perfectly distinct species by the characters of its leaves and involucre, the bracts of which latter, in eastern plants, are obtuse.

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[1] Barton, Comp. Fl. Philad. ii. 184. Darlington, Flora Cestrica, 495. Wood, Class Book, 10 ed. 351.

A. PEDICELLATA. Slender, more than a foot high, the stems with scattered spreading and rather conspicuous leaves instead of upright bracts: lowest leaves on short ascending branches hardly to be called stolons or surculi, small, oblanceolate, acute, nerveless, permanently tomentose on both faces and thin: heads on slender pedicels of $\frac{1}{2}$ to 1 inch in length, thus forming a lax subcorymbose cyme: involucres short and subcampanulate, their bracts in only about 3 series, the tips of the inner narrow, acutish or obtuse: achenes obscurely 5-angled as well as very minutely and sparsely granular.

Collected in the Blue Mountains of Oregon, at "alpine" or perhaps subalpine elevations, by Mr. Cusick.

The staminate plants of neither of these far-western species seem to be known.

There are indications, in the herbarium of the U. S. Museum, of yet another undescribed member of this group from the hills of western Nebraska, the specimens having been collected by Mr. Rydberg. But the two following, belonging to western montane or subalpine districts, are found in the herbaria under names which appertain to Old World species.

A. PARVIFOLIA, Nutt. Trans. Am. Phil. Soc. vii. 406. A very characteristic species of the elevated plains and subalpine valleys of the whole Rocky Mountain region from New Mexico northward, well distinguished by Nuttall, yet, by authors of less knowledge and experience, referred since to *A. dioica*. In its form or variety ROSEA, it is a beautiful plant. It is readily distinguished from true *A. dioica* by its want of proper stolons, having short and suberect or at most, merely ascending, sterile basal branches instead of them. Also its leaves are without distinction of blade or petiole, small and narrow, and equally woolly, and permanently so, on both faces. The real American analogue of *A. dioica* is *A. neglecta*, these two differing chiefly in habit; but *A. dioica*, though with leaves glabrate above, has its own peculiar leaf-

outline, the organ consisting of a short round-obovate blade and distinct narrow petiole; but its male and female plants are of the same size, as to height of stem, while the staminate plant in *A. neglecta* is so short as to seem as if it might belong to another species.

A. PULCHERRIMA. *A. Carpathica*, var. *pulcherrima*, Hook. Fl. i. 329. It seems to me that all the so-called *A. carpathica* of North America must be admitted to the rank of a species, and under this name. I find no American specimens which do not present a strong contrast to those of the Old World bearing this name. The lower leaves in our plant are relatively much larger, white-tomentose on both sides, permanently, and, notwithstanding their woolliness, are obviously 3-ribbed. These points, together with the floral characters indicated by Hooker, and more fully by Gray, establish a species not, I believe, very closely analogous even to the Old World plant to which it has been so long referred.

The Antennarias of the southern Atlantic United States are, I suspect, much in need of investigation; and one of these I must here readmit to specific rank.

A. MONOCEPHALA. *Gnaphalium monocephalum*, Carpenter, in Torr. & Gray, Fl. ii. 431. *Antennaria plantaginifolia monocephala*, Torr. & Gray, l. c.; Kearney, Bull. Torr. Club xx. 254. This, when its vegetative characters receive due consideration, must needs be admitted to the rank of a species. Its leaves come nearest to those of true *A. plantaginifolia*, being broad, and displaying the 3 rib-like parallel nerves characteristic of that; but the leaf-outline is very different, being distinctly obovate, and the petiole very short. Then again the stolons are extremely unlike those of *A. plantaginifolia*, being very stout, long and prostrate, merely bracted, as in the very slender ones of *A. neglecta*, and leafy only at the end.

In so far as the range of this species is indicated by speci-

mens in my own herbarium and that of the U. S. Museum, it is peculiarly southern, and perhaps somewhat local. The best illustration of it which I have seen is an ample sheet in the Langlois collection at the Catholic University, these specimens having been obtained by A. Ruth, near Knoxville, Tenn., in April, 1894. An original Louisiana specimen, by Carpenter, is in the U. S. Herbarium, and also a sheet of Mr. Kearney's collecting at the Tennessee station.

Mr. Kearney, in his paper cited above, speaks of the plant as "heretofore known only from Louisiana;" but, at the place of its first publication in the Torrey & Gray Flora, it is credited to some place near Philadelphia" as having been seen or obtained there by Mr. Lea. It is, of course, possible that the true *A. monocephala* may yet be found to occur over a greater extent of territory than we have supposed; but it may also be merely monocephalous states of genuine *A. plantaginifolia* exist, and that the Philadelphia plant may be such.

## 2. *Some Atlantic species of* EUPATORIUM.

E. LECHEÆFOLIUM. Erect, 2 feet high, from few and coarse elongated fibrous roots; stem parted toward the summit into many slender corymbose branches, all appressed-puberulent, the foliage glabrous and strongly punctate: leaves all narrowly linear, entire, the cauline 1½ inches long, spreading or recurved, bearing in their axils short sterile branches, these very slender and leafy with small thyme-like leaves: heads very many and small, in an ample compound somewhat flat topped cyme; the 4 or 5 main bracts of the involucre oblong-linear, acutish, glandular: corolla with slender tube and funnel-form throat and limb: achenes very small, strongly glandular; pappus fine and scabrous.

Northern Florida, Sept., 1895, Geo. V. Nash (n. 2566).

E. HYSSOPIFOLIUM, Linn. Sp. 836. Under the name *E. hyssopifolium* a considerable aggregate of forms, some specific,

others varietal, has now become accumulated in the herbaria. This gathering in of many different plants under one specific name is a natural result of easy methods of procedure. It is much more easy to unite and combine forms than to distinguish them. And then, when the diagnostic characters of two related species are plain, it is often next to impossible to determine to which species the old name really belongs. Such considerations as these may have led botanists to continue treating as one, two species easily distinguishable by character.

But I doubt if any one since De Candolle[1], in 1836, has made a careful and thorough investigation as to the type of Linnæus' *E. hyssopifolium.* A year ago I went over the bibliographic ground of the species, reaching only partially satisfactory conclusions. A recent repetition of that study, with more herbarium material at hand, has convinced me that even Linnæus had two species under the name; in other words, that the two figures cited by him as representing *E. hyssopifolium* are figures of two species; that the plate of Dillenius is the one answering to Linnæus' description of the species, while that of Plukenet was in all probability taken from the plant long afterwards named *E. linearifolium* by De Candolle. And I now observe that De Candolle appears to have been brought to the like conclusion; for he nowhere cites Plukenet's figure, but leaves *E. hyssopifolium*, Linn., as identical with the plant of Dillenius only.

The most essential feature of the species, as defined by Linnæus, is the triple-nerved character of all the leaves, even the uppermost and most reduced of them, as the Dillenian figure shows. But very little of what is now in the herbaria of American botanists under the name shows anything of the triple-nerved character; but in one form, namely, that to which Dr. Gray at last assigned the varietal name *laciniatum*, all the leaves, whether of stem, branches or branchlets, are distinctly three-nerved. Moreover, the upper leaves in

[1] Prodr. v. 177.

this form are perfectly entire, and thus fully answer to that part of the Linnæan description and Dillenian figure. I am quite convinced that, in those forms of Gray's *E. hyssopifolium laciniatum* that have their lower leaves merely serrate-toothed, not laciniate, we have the type of *E. hyssopifolium* Linn. The rather lax and open inflorescence, and also the scarcity of fascicled axillary small leaves, amounts to another point of agreement with the type figure; and it is also to be distinguished from the plants of linear 1-nerved leaves by the lighter green of the herbage. This last-named character was even brought out by one of the contemporaries of Linnæus. The plant had been cultivated in Europe for fifty years, at the time when Linnæus named it, and Philip Miller in 1759 describes its leaves as "of a light green colour."[1]

Now against this proposition of mine, that true *E. hyssopifolium* is practically Gray's var. *laciniatum*, there is an early statement of Gray himself to be considered. As long ago as 1841 he said that "the Linnæan species was founded on the narrow-leaved plant (*E. linearifolium*, DC.) in which the lower leaves are always 3-nerved and often toothed."[2] The natural and easy refutation of all this is, that even the uppermost and rameal leaves in the Dillenian figure, and in the plant which I here identify with it, *i. e.*, the *laciniatum* variety, are distinctly 3-nerved, as they never are in *D. linearifolium*. It is no question of the nervation of the proper stem-leaves, but of even the uppermost; and only that part of the Linnæan *hyssopifolium* which Plukenet's figure represents is equivalent to *linearifolium*. But that can not stand for typical *hyssopifolium* for the reason that Linnæus gives precedence to the Dillenian plate as the true type. And the worthiest of Linnæus' contemporaries, as to his knowledge of American compositæ, Miller, confirms this. He, a more accurate man than Linnæus, and of a more thorough

[1] Gardener's Dictionary, ed. 7.
[2] Torr. & Gray, Fl. ii. 84.

knowledge of the plants under consideration, knew no *Eupatorium* with leaves linear, entire and one-nerved; nor is there any evidence that Linnæus did. So I find it impossible not to accept the following as a good species:

E. LINEARIFOLIUM, Walter? DC. Prodr. vi. 177. Over and above its characters of a dark green herbage, narrowly linear 1-nerved leaves, and abundant axillary leafy branchlets, this species has the peculiarity of a thick fleshy fusiform or tuberiform root, at least in certain localities; though I am not sure that we have not still, even with the southern fibrous-rooted *E. lecheæfolium* excluded, a number of species under this name. It is more common than true *E. hyssopifolium*, under which name it is held in most of the herbaria.

E. JUCUNDUM. *E. incisum*, Chapm. Fl. 3 ed. 216 (1897), a name precluded by the *E. incisum*, Rich. Act. Soc. Hist. Nat. Par. i. 112 (1792).

### 3. *The Genus* MESADENIA.

The natural group of plants forming the basis of the genus *Cacalia* is African and East Indian. The species are shrubs, with stout half-fleshy stems and succulent foliage, forming an assemblage of cactaceous compositæ, so to speak. Several of them are, and for a century or two have been, cultivated in conservatories and collections of curious exotic succulents. With these, our several well known perennials of the Eastern and Southern States have no very near affinity; and their marked habital peculiarity and floral characters long ago led several of the most discerning among systematists to segregate them from *Cacalia*. Their marked disagreement with that genus seems first to have been indicated by Cassini in 1827;[1] and with a sagacity that has

[1] Dict. xlviii. 460.

scarcely had a parallel in the history of systematic botany, he declined to assign a generic name to the group, for the reason that he seemed to see in—what has proven a complete enigma to all other botanists of the last seventy-five years—the *Arnoglossum* of Rafinesque,[1] a generic type that would naturally include these plants.

Nine years after Cassini's rejection of *C. atriplicifolia* from *Cacalia*, both De Candolle and Rafinesque, and perhaps independently of one another, segregated the plants in question from *Cacalia;* the former incompletely, indicating their characters, but elevating them to subgeneric rank only;[2] the latter fully characterizing the genus MESADENIA, naming the old species under this genus-name, and giving full diagnoses of several proposed new ones.[3] But this *New Flora* monograph is not the original publishing of this genus as a genus. MESADENIA was sufficiently established by a paragraph in *Loudon's Gardener's Magazine* as early as 1832.[4] And, as for the *Arnoglossum* of the same author in 1817, the name was a homonym, and could not stand, but, as I shall more fully indicate under one of the species, the type must in all probability have been one of the *Mesadenia* species.

Still another specialist, in the study of the Compositæ—Schultze—in 1845 reaffirmed the proposition that these plants are not Cacalias, but placed them in *Senecio;*[5] a course which appears to have been first indicated by Sir William Hooker in 1833,[6] and which Mr. Bentham adhered to as late as 1873, though we must credit him with having had the consistency of remanding also to *Senecio* all, even the typical African succulent Cacalias; so that with him *Cacalia* as well as *Mesadenia* are but synonyms of *Senecio*.[7]

But this method of procedure, which herbarium botanists

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[1] Fl. Ludov. 65.
[2] Prodr. vi. 329.
[3] New Flora, iv. 78, 79.
[4] Vol. viii. p. 247.
[5] Flora, vol. xxviii.
[6] Fl. Bor. Am. i. 332.
[7] Gen. Pl. iii. 449.

find so easy, does not satisfy; and Asa Gray, to the last, held our plants to be distinct from *Senecio*, though he did not distinguish them from *Cacalia;* but of his *Cacalia*[1] the *Mesadenia* species form with him, as with De Candolle, a subgenus; though his statement of its characters is not as strong as the plants warrant. The fullest diagnosis of the genus is that given by Rafinesque; and the species may bear names as follows:

1. M. ATRIPLICIFOLIA, Raf. New Flora, iv. 79 (1836). *Cacalia atriplicifolia*, Linn. Sp. ii. 835 (1753). *Senecio atriplicifolius*, Hook. Fl. i. 332 (1833). To this old species an improbable geographic range is ascribed, as from Canada and New York to Minnesota, and southward to the Gulf States. No doubt several species are included in it, which more thorough research may enable one to segregate, and perhaps to refer to one or more of the species yet unrecognized which Rafinesque described.

2. M. RENIFORMIS, Raf. l. c. *Cacalia reniformis*, Muhl. in Willd. Sp. iii. 1735 (1803). *Synosma reniformis*, Raf. in Loud. Gard. Mag. viii. 247 (1832). *Senecio Muhlenbergii*, Sch. Bip. in Flora, xxvii. 499 (1845). To this, numerous flowers to the head were erroneously attributed in the original description, which circumstance may have led Rafinesque to suppose that it belonged to his genus *Synosma*. Its range is less extended than that of the first species, it being only eastern and southern in its distribution.

3. M. OVATA, Raf. l. c. *Cacalia ovata*, Walt. Carol. 196 (1785); Ell. Sk. ii. 310 (1824). *Senecio Walteri*, Sch. Bip. l. c. Species of damp woods in the Gulf States, extending northward to Carolina.

4. M. DIVERSIFOLIA. *Cacalia diversifolia*, Torr. & Gray, Fl. ii. 435 (1843). From South Carolina to Florida, in swamps.

[1] Syn. Fl. 396.

5. M. FLORIDANA. *Cacalia Floridana*, Gray, Proc. Am. Acad. xix. 52 (1883). Habitat of the preceding nearly, but more southerly, being known only from eastern Florida.

6. M. PLANTAGINEA, Raf. New Flora, l. c. (1836). *Arnoglossum plantagineum*, Raf. Fl. Ludov. 65 (1817), probably. *Cacalia tuberosa*, Nutt. Gen. ii. 138 (1818). *Senecio Nuttallii*, Sch. Bip. in Flora, l. c. (1845). Plant indigenous to almost the whole Mississippi Valley north and south, and there is scarcely room for doubt that it is the type of Rafinesque's unluckily designated genus *Arnoglossum*. Indeed, his own employment of the specific name *plantagineum* for it, under *Mesadenia* can hardly be construed to mean less than this, that he recognized the identity of Robin's plant with that which Nuttall had named *Cacalia tuberosa*; and he expressly says that, of his *M. plantaginea*, *C. tuberosa* is a synonym.

7. M. LANCEOLATA, Raf. New Flora, l. c. *Cacalia lanceolata*, Nutt. Gen. l. c. Species of wet pine barrens along the southern Atlantic seaboard.

## 4. *Four New Species.*

PYRROCOMA LONGIFOLIA. Leaves almost all radical, suberect, thinnish, a foot long or more, narrowly oblanceolate, obtusish, entire, or callous-dentate, long-petiolate: stems several and subscapiform, little longer than the leaves and leafy-bracted, mostly monocephalous: involucre broadly turbinate or subcampanulate, $\frac{3}{4}$ in. high; bracts spatulate and oblanceolate, all with ample green-herbaceous tips and subequal, the outer quite as long as the inner: rays 30 or more.

Mount Eden, Alameda Co., California, May, 1891, Brandegee. A glabrous species, related to *P. elata*, but of very pronounced specific characters; perhaps local.

PYRROCOMA CILIOLATA. Slender but rather rigid, decumbent, 2 feet high: radical leaves unknown; cauline ones lanceolate, acuminate, broadest at the sessile base, closely and rigidly ciliolate from base to apex: heads on slender bracted pedicels, forming a loose raceme: involucre hemispherical, less than $\frac{1}{2}$ inch broad and high, the oblong-linear bracts coriaceous, slightly narrowed under the broadly triangular spreading green tip: rays 15 to 20, short.

Dry plains at Bakersfield, California, Miss Eastwood.

Both these species should have been included in the *Flora Franciscana*, the pages of which are now in print and soon to be issued. At the time of printing the genus *Pyrrocoma* for that work, I was unmindful of the fact that I had drawn up diagnoses of these, long ago, from the specimens existing in the herbarium of the California Academy.

ANTENNARIA NEODIOICA. Stems of the female plant slender, about a foot high, those of the male a third shorter, very notably and loosely flocculent: stolons short, numerous, assurgent, leafy throughout: leaves with short broadly obovate acute 3-nerved blade and longer ligulate petiolar basal part, densely white-tomentose beneath, pale and glabrate above: heads of female plant all distinctly and slenderly pediceilate and corymbose, or often subracemose by excessive elongation of the pedicels ($1\frac{1}{2}$ or 2 inches long) of two or more of the heads: scarious tips to outer bracts of female involucre very short and obtuse, of the inner long, lanceolate, acutish: achenes short, obtusely 4-angled, rather coarsely and obviously granular-papillose: bracts of male involucre all very broad and obtuse, or truncate, or even emarginate: pappus of male flowers with short abrupt very distinctly and evenly serrate terminal dilatation.

Plentiful in open glades of the upper Delaware River, above Stroudsburg, and near Bushkill, Pennsylvania, associated with *A. plantaginifolia*, but most distinct from it; and equally distinct from *A. neglecta*, which there grows

sparingly, and in rather moist meadow lands only, and is past its seeding even at the time that this and *A. plantaginifolia* are just out of flower. The species may no doubt be widely dispersed, and common. It is quite like *A. dioica* of Europe in habit, though with narrower foliage, and extremely different inflorescence and general characters of heads and fruit. Between these three *Antennarias* distinguished on the pages of this issue, there is not a hint of intergradation yet discovered. But there is a possibility that *A. neodioca* may be the plant intended by Nuttall as *A. Labradorica;* but our plant does not answer to his description.

ERIOPHYLLUM TERNATUM. Stems (perhaps 2 or 3 feet high) remotely leafy up to the corymb of slender-peduncled heads: leaves at least partly opposite, on slender petioles, ternately divided into 3 petiolulate and loosely pinnate-parted leaflets, of thin texture, flocculent below (as also the stem and involucres), glabrous above, the ultimate segments of all triangular-lanceolate or subulate: involucres campanulate, not more than 3 lines high, the broad firm carinate-nerved bracts closely compacted as if coherent, yet wholly distinct, numbering only 6 or 7, their tips recurved: rays showy: disk-flowers with short very glandular-hirsute tube: achenes sharply angled, sparsely gland-dotted, still more sparsely hairy, or quite glabrous; pappus of about 8 unequal short but not connivent paleæ.

Found on the streets of Ashland, Oregon, in 1893, by Mrs. Austin; only the upper portions of several stems collected, but these showing excellent characters of foliage and inflorescence; though the root and basal part of stems are unknown.

# Corrections in Nomenclature.—I.

Astragalus Sonneanus. *A. Hookerianus*, Gray, Proc. Acad. vi. 215 (1864), not of Dietr. Syn. iv. 1086 (1847). *Phaca Hookeriana*, T. & G. Fl. i. 693 (1840). When Dr. Gray, in 1864, transferred this species from *Phaca* to *Astragalus* he was manifestly unaware of the existence of a Mexican *Astragalus* already established under the name of *A. Hookerianus* which rendered his new homonymous combination untenable. I dedicate the species to the most unassuming but one of the most efficient of field laborers in Californian botany, Mr. C. F. Sonne.

Trifolium Ortegæ. *T. involucratum*, Ortega, Dec. 33 (1797); Willd. sp. iii. 1372 (1801), not of Lamarck, Fl. Fr. ii. 604 (1778). Species peculiar to the mountains of Mexico; though a number of different plants of the Pacific U. S. have been erroneously supposed to represent it, or at least to be referable to it. Until the publishing of the *Index Kewensis* all authors had erred in attributing to Willdenow rather than to Ortega the authorship of the name *T. involucratum*; but the very much earlier use of the same name, by Lamarck, was not detected even by the authors of the *Index*.

Senecio Porteri. *S. renifolius*, Porter, Fl. Colo. 83 (1874), not of Sch. Bip. Flora, xxviii. 50 (1845). *S. Porteri* is a rare species of the Colorado Rocky Mountains; the original *S. renifolius*, of the Caucasus.

Erigeron consobrinus. *E. fraternus*, Greene, Pitt. iii. 162, not of Pitt. ii. 169 (1891). Miss Josephine Clarke, of the Library of the Department of Agriculture, has courteously brought to my attention the error here corrected.

For a genus of beautiful amaryllids of the Western World *Zephyranthes* is a most admirable name; but it is one which, under the law of priority, cannot be maintained. And *Atamasco* or ATAMOSCO, which certainly antedates it in publication, is also not a displeasing appellation by any means.

From a cursory examination of the history of the Atamasco Lily, it appears that Rafinesque in 1825 supposed himself to be assigning a tenable name to the genus as distinct from *Amaryllis*, when he proposed to call it *Atamasco*. He was doubtless unaware of Herbert's having named it *Zephyranthes* in 1821. But I do not see how it has so long been overlooked that Adanson, as early as 1763, designated the original species as type of a genus ATAMOSCO. Only a few of the species are known to me.

A. ATAMASCO. *Amaryllis Atamasco*, Linn. sp. 292 (1753). *Zephyranthes Atamasco*, Herb. App. Bot. Reg. 36 (1821). The above combination—*Atamosco Atamasco*—is not to be interpreted as approving duplicate binary names. There is a difference, though I admit it is small, in the pronunciation, as in the spelling of the two terms of the name.

A. TREATIÆ. *Zephyranthes Treatiæ*, Wats. Proc. Am. Acad. xiv. 300 (1879). Indigenous to eastern Florida.

A. SIMPSONI. *Zephyranthes Simpsoni*, Chapm. Fl. S. States, 3 ed. 493 (1897). Low pine barrens of southern Florida.

A. PULCHELLA. *Zephyranthes pulchella*, J. G. Smith, Sixth Rep. Missouri Bot. Gard. 114 (1895). Native of southern Texas.

A. TEXANA. *Zephyranthes Texana*. Herb. Bot. Mag. under t. 3482. Also a Texan species exclusively, as far as known.

A. ARENICOLA. *Zephyranthes arenicola*, Brandg. Proc. Calif. Acad. 2 ser. ii. 205 (1889). Islands of the Mexican coast (of Lower California).

A. ROSEA. ZEPHYRANTHES ROSEA, Lindl. Bot. Reg. t. 821 (1824). *Amaryllis rosea* Spreng.? Native of the West Indies.

A. TAUBERTIANA. *Zephyranthes Taubertiana*, Harms, in Regel's Gartenflora, xlv. 281, t. 1427 (1896). A Brazilian species.

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## RANUNCULACEOUS MONOTYPES.

In a letter addressed to the writer many years since, the late Dr. Asa Gray expressed his own dislike of monotypic genera; but in the same sentence he made the admission that "nature likes them." Here was a virtual acknowledgment that the herbarium botanist scarcely dares to be natural in his systematizing; preferring, as "safer," the methods of the artificialist and the empiric. Such tendencies are the natural outcome of years of work done almost exclusively in the herbarium; for here the scantiness of resource narrowly impels one to the uncertain guidance of the merest and driest technicalities.

According to nature, a genus is a genus whether it embrace five species or ten, a thousand, or only one; and the three which I here discuss are, so far as known, monotypical.

KUMLIENIA HYSTRICULA, Greene, Bull. Calif. Acad. i. 337 (Pittonia, Plate II). I need not here repeat the excellent characters of the genus. The accompanying plate, from a carefully done and very accurate drawing by Mr. Holm, plainly exhibits the unique corolla-like calyx, the circle of small staminodial organs which take the place of petals, and the long slender pubescent utricle which corresponds to the achene in the genus *Ranunculus*.

When twenty years since Dr. Gray published the plant as a new *Ranunculus*, he did so in terms that illustrate fully the Linnæan artificialism that ruled his botanical mind and the essential empiricism of his own taxonomic methods; for

he compares the plant with something so totally diverse from it as the *Ranunculus apiifolius* of Persoon, the genus *Aphanostemma* of St. Hilaire. This, as far as the general and habital resemblances go—and these go far in all natural classifying—was much as if he had compared *Caltha palustris* with *Ranunculus sceleratus* as being plants closely allied. It is not more impossible to find superficial resemblances between these two than between *Kumlienia* and *Aphanostemma*. This last is a mere South American analogue of *R. sceleratus* and is much like it both in habit and character. But this suggestion of an affinity between things extremely unlike is not so remarkable as the statement that in characters of calyx and corolla they are alike; and our author thrice published it that this has the sepals and petals of *Aphanostemma*.[1] Now in *Kumlienia*, one of the most marked characters is its large white calyx, the sepals of which combine to form that almost cup-like whorl which, like that in *Caltha*, *Trollius*, etc., is popularly mistaken for a corolla; and there is no more likeness between the calyx of *Kumlienia* and that of *Aphanostemma* than between *Kumlienia* and any very small-flowered *Ranunculus*. They are small and reflexed, so as to be almost out of sight, as in many another small-flowered species of that genus. They are said to be whitish or flesh-colored; but how much force this trifling circumstance of color of the sepals ought to have, in this case, may well be intimated by supposing a white or pink flowered *R. sceleratus* or *abortivus* to be brought in as a proof of congeneric affinity between it and *Kumlienia*. There is, indeed, such an almost total dearth of common characteristics between *Kumlienia* and *Aphanostemma* that I am puzzled to understand how any comparison between them could have been suggested. The mere color of the flowers is all I can find. The petals, though appearing as mere nectaries in both, are not much alike in form. I am very

[1] Proc. Am. Acad. vii. 328; op. cit. xxi. 365; Syn. Fl. i. 22.

confident that an unbiassed judgment, formed upon thorough knowledge of the characteristics of *Kumlienia*, will rule that no more valid genus has been added to the Ranunculaceæ within a century.

EXPLANATION OF PLATE II.—Small plant of the natural size; *a*, front view of petal, 4 times natural size; *b*, head of utricles, natural size; *c*, utricular fruit 6 times enlarged.

ARCTERANTHIS COOLEYÆ. *Ranunculus Cooleyæ*, Rose, U. S. Herb. i. 289, t. 22. *Kumlienia Cooleyæ*, Greene, Eryth. ii. 193 & iii. 53. (Pittonia, Plate III). In this type there is, as compared with *Kumlienia*, a deficiency of technical characters by which to establish it in generic rank to the satisfaction of that botanical multitude, the artificialists. *Arcteranthis* is *sui generis* none the less, and for the reason that it cannot be naturally referred to *Ranunculus*, or to *Caltha*, *Kumlienia*, *Trollius*, or any other recognized genus. The genera *Caltha* and *Trollius* are distinguished by nothing but general differences of foliage and habit; yet almost all authors keep them distinct. Only the late very distinguished organographer and systematist, M. Baillon, made of them one genus. And *Arcteranthis*, as to foliage and flower, bears a strong likeness to *Trollius*. But its fruit is a head of achenes; that of *Trollius* a whorl of follicles; therefore the former is not reducible to the latter. As I have already indicated, and as the figure of the flower will demonstrate, it cannot reasonably be placed as a *Ranunculus*. Neither its calyx nor its corolla—and these circles are not themselves very distinct the one from the other—are those of any buttercup. And, if I formerly referred the species to *Kumlienia*, that was at first because of my having placed too much faith in the accuracy of the figure published by Mr. Rose. That figure certainly indicates a plant more resembling *Kumlienia* than is warranted by the specimens. As to the flower, the figure departs from nature very widely; for the petals are represented not only as being very distinct from the sepals

as a floral circle, they are shown to be of not more than one-third the size of the sepals, and both these errors are in the direction of a likeness to *Kumlienia*. Mr. Rose had no warrant for the presentation of such a flower as that of his figure. The specimens known to him were all out of flower; and this flower of his plate must have been reconstructed from perhaps one or more withered abortive petals that may have been found somewhere among the specimens. It is this very grave misrepresentation of the floral structure in this original plate which has seemed to call for the publication of a correct representation, such as is given in the plate accompanying these paragraphs. I must also here call attention to another serious defect in Mr. Rose's figure, one which falsifies the relation of the plant to *Ranunculus*. That is, the branched and two-flowered scape. The type specimen, from which the plate in question was made, has two perfectly naked scapes, each with its terminal head of achenes. It has been explained to me that this error came about through a mistake in the mounting of the specimen; this sundered terminal half of the second scape having been fastened down, in this false position of a branch to the other, in the process of mounting. This error has long since been corrected, as to the herbarium sheet, while no published statement of this item of falsity in the figure has until now been made. This error, along with the still more serious one as to the sepals and petals, makes it easy to adopt the view that the plant may be a *Ranunculus*. How grave these errors are may be appreciated by any one who will compare the figure thus criticised with the one in the present volume. If people were to go by the plates alone, they might easily and reasonably judge them to represent two very different species, if not indeed representatives of two genera. Yet I, who have the largest and fairest collection extant of specimens of the plant, am certain that they are all of one and the same species.

There is also, in my plate of *Arcteranthis*, one seeming error, by which a too near relation to *Ranunculus* might be inferred. The head of ovaries, and also the separate and magnified individual ovary, are quite like the achenes of many buttercups. It must therefore be borne in mind that these are ovaries, not achenes. Mr. Rose's specimens were all in fruit, and his representation of the achene appears to be faultless. It is a proper achene, and very far from the utricular carpel of *Kumlienia*. Neither does it resemble, except in the matter of its ribs, the achene of *Cyrtorhyncha*; for the beak is recurved, quite as in *Ranunculus*, not inflexed.

The distinctly unguiculate petal of Mr. Rose's description and plate would, were the character an actual one, become another point of analogy with *Cyrtorhyncha*. But the plant has not at all such a petal. Precisely its true form and character may be seen in our Plate III.

Mr. Holm's thorough training and long experience in the study of the subterranean organs of plants have rendered his eye very keen in detecting such peculiarities of the roots as are well brought out by him in these three figures. Of *Kumlienia* the root is very fleshy and pubescent. That of *Arcteranthis* is more slender and perfectly glabrous. I must also add, by way of further criticism of Mr. Rose's plate, that the representation of a subterranean rootstock—or of a fusiform branched fleshy root—is altogether fictitious.

As on the earliest pages of the present issue of PITTONIA, *Eranthis* is shown to be a mere synonym for the Winter Hellebore, I have combined that name with *arctos*, to form an appropriate generic name for this beautiful monotype of the far-off subarctic early spring.

EXPLANATION OF PLATE III.—Flowering plant, natural size; *a*, flower of natural size showing back of sepals and petals; *b*, petal, front view, natural size; *c*, head of half-grown ovaries, natural size; *d*, ovary of same stage, 5 times enlarged.

CYRTORHYNCHA RANUNCULINA, Nutt. in Torr. & Gray, Fl. i. 26. *Ranunculus Nuttallii*, Gray, Proc. Philad. Acad. 1863, p. 56. (Pittonia, Plate IV). This is a genus of equal validity with *Kumlienia*, notwithstanding its far more striking superficial likeness to typical *Ranunculus*. Any botanist coming upon a tuft of the plant in its native habitat would be sure to take it, at first glance, for an effusely cymose small-flowered buttercup; and that Nuttall, its discoverer, received such an impression of it is intimated in the specific name which he gave it. But its strength as a generic type rests upon characteristics such as the most artificial among systematists might be expected to appreciate. As being the only critical botanist who, after Nuttall, has seen the plant growing, and having at various times during the last twenty-five years examined and collected it, I have not only to confirm Nuttall's original observations concerning it, but to add somewhat to the knowledge of its peculiarities as a type. Several of its analogies with *Thalictrum* were early recognized; but here is one which the field observer alone will be likely to detect. On digging up specimens for the portfolio, one perceives that the roots are not the soft white roots of *Ranunculus*, but quite the hard wiry fibres, black externally and yellowish within, which belong quite generally to *Thalictrum*. And the stems and leafstalks under the ground are intermixed with just such dry thin chaffy remains of the leafstalks of former years as are seen in many species of meadow rue.

The strong technical characters of the genus are found, where herbaristic and empiric taxonomists like to have them, in the fructification. The inflorescence is remarkably, and even more or less dichotomously cymose; and specimens are not wanting to my herbarium which show a much more repeatedly and effusely branched cyme than is displayed in the small plant selected by Mr. Holm as the type from which to draw. In one of the specimens each branchlet ends in an actual umbel of several flowers. The

floral receptacle is wholly unlike that of any *Ranunculus*, being very small and almost flat, so that the achenes are either erect, or the outer ones merely ascending, the whole head of them being only broadly turbinate, never globular as in *Ranunculus*, when the receptacle itself by being rounded determines a globular or ovoid rather than turbinate outline to the fruit head. All authors, including Nuttall himself, have failed to perceive this character, and have erred in describing the heads as globular or globose; though Nuttall's term "spheroidal" is sufficiently loose, as to the possibilities of its interpretation, to exempt him from this criticism. But broadly turbinate does, without ambiguity, express the form of the fruit heads, unless in some instances they be found to be hemispherical; and this seems to be true in a few immature heads dried under much pressure. That the carpels, achenes, are imitative of those of *Thalictrum*, is a character which cannot elude observation; but the style differs from that of *Thalictrum* as much as from that of *Ranunculus*, for it is inflexed, and usually quite abruptly so.

Since the accompanying plate of *Cyrtorhyncha* was printed—and I had believed that it was to be the first figure ever issued of this interesting plant—the second volume of Dr. Britton's *Illustrated Flora* has appeared, and with a figure purporting to represent this type. The genus is reinstated by Dr. Britton, but the imperfect figure is so completely subversive of the generic characters that, in so far as it may be received as representing the plant, it will confirm the idea set forth by Bentham and by Gray, that the plant is, after all, nothing but a *Ranunculus* with ribbed achenes. For, instead of the seven or eight narrow almost ligulate petals of *Cyrtorhyncha*, Dr. Britton has given us the five short rounded petals of almost any *Ranunculus*. In place of the ample more than half dichotomous naked cyme, he has presented us with a buttercup stem, with two or three solitary flowers, each in the axil of a leaf, quite as in many

buttercups. The beak of the achene is, by that figure, wholly ambiguous, that is, you may construe it as curved inwards or outwards as you like. This is, however, well suited to the contradiction made in the text accompanying the cut; for said beak is described as "incurved" in the generic character, and in the specific character as "recurved." The student may take his choice; but the truth is, that this beak is neither recurved nor incurved, but inflexed.

There is not the slightest foundation that I can find for the statement made in the *Synoptical Flora*, that the achenes in this type are "somewhat utricular." Such a character, were it to be found, would furnish at least some hint of a support to the doctrine of some of our contemporaries that this plant and our *Kumlienia* are interrelated. Such characters are doubtless wished for; but this one does not exist. The *Cyrtorhyncha* pericarp is neither thin nor loose, nor even turgid, as implying a loose investiture of the seed.

EXPLANATION OF PLATE IV.—Small plant, natural size; *a*, sepal about 6 times enlarged; *b*, petal correspondingly enlarged; *c*, head of achenes about 4 times enlarged; *d*, achene about 5 or 6 times the natural size.

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## NEW WESTERN PLANTS.

ASTRAGALUS CAMPYLOPHYLLUS. Perennial, the tufted stems erect, flexuous and branching, 2 feet high, pale throughout with a fine short appressed pubescence, the foliage inconspicuous and simulating sterile branches, the leaf consisting of a long curved rachis with or without 1 to 3 distinct pairs of linear-filiform leaflets: fruit in rigidly erect terminal loose spikes: calyx campanulate, with 5 short triangular teeth: pods $\frac{1}{2}$ inch long or more, erect, incurved, the valves thick, cartilaginous, with prominent sutures and clothed with a fine almost silky pubescence.

Sandy deserts of the lower Humboldt River, Nevada, near the Humboldt House, collected by the writer, in leaf and fruit only, 22 July 1894. Intimately allied to *A. Serenoi*, Sheld. (*A. nudus*, Wats.), but differing in its short calyx-teeth, small subsessile pubescent pods, as also by the much greater size of the whole plant, and its desert lowland habitat, *A. Serenoi* belonging to the more fertile elevations of the mountains, but being nevertheless a small and inconspicuous bush as compared with this large tufted and reedy or broomy denizen of the dry desert plains.

ASTRAGALUS CYMATODES. Related to *A. caryocarpus*, and perennial, with stems more slender, less leafy, decumbent or assurgent, less than a foot long in full maturity; herbage sparsely villous-pubescent under a lens: leaflets in 10 to 12 pairs, oblong, retuse or emarginate, about ¾ inch long: flowers unknown: calyx subcylindric, the narrowly lanceolate subequal herbaceous teeth more than half as long as the tube: pods hard-cartilaginous, of quadrate-ovoid outline, somewhat compressed, almost completely 2-celled, about ¾ inch long including the stout straight subulate beak of a line's length, the sutures prominent, the sides closely and prominently wavy-striate transversely, the body of the pod raised on a stoutish stipe twice as long as the calyx.

The specimens from which the above diagnosis is drawn have long been in my herbarium, from somewhere in the upper part of the valley of the Sacramento in California. They are in mature fruit only, and indicate a fleshy-podded species manifestly allied to *A. caryocarpus*, and also recalling my *A. circumdatus* of Lower California. The long-peduncled spikes are short and few-flowered, judging from their appearance in the fruiting state.

ASTRAGALUS WILSONII. Perennial, the several stoutish stems less than a foot high, erect from a short decumbent base, with short nodes and long leaves; herbage almost glabrous, the stems purplish: leaves subsessile; stipules thin,

deltoid or triangular-lanceolate; leaflets in 10–15 pairs, from obovate to oval, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, truncate or retuse: flowering peduncles stout, shorter than the leaves, having short few-flowered racemes: flowers about $\frac{3}{4}$ inch long; calyx subcylindric, the linear teeth half the length of the tube; corolla pale, whitish or pinkish: pods about 1 inch long, lanceolate-cymbiform, acuminate, obcompressed, 1-celled, but both sutures a little intruded, of firm parchment texture, glabrous and marbled with dark red or purple externally.

Collected in northern Arizona, May, 1893, by Norman C. Wilson. Related to *A. diphysus*, but with long and narrow only slightly inflated pods.

MERTENSIA LINEARIS. Stems tufted on the subligneous crown of a strong tap root, slender, ascending, about a foot high, leafy to the summit, the inflorescence being a loose leafy panicle of slender few-flowered racemes: radical leaves narrowly lanceolate, $1\frac{1}{2}$ inches long, on slender petioles as long, the cauline rather longer, linear and sessile, acute, all conspicuously 1-nerved, without lateral veins, roughish above with a minute strigose closely appressed short hairiness, the margins minutely scabrous-serrulate: calyx deeply parted into triangular carinate-nerved segments, their margins beset with few and appressed ciliæ: corolla $\frac{1}{4}$ inch long, blue, the proper tube and the campanulate limb about equal: ovate-trigonous nutlets neither carinate nor margined, the back minutely sinuate-rugose.

Common species of dry open ground in the foothills and lower mountains of Colorado, Wyoming, etc. It has been referred to *M. lanceolata*, along with the quite distinct *M. Fendleri*, to which latter it is more related.

MERTENSIA ARIZONICA. Leafy throughout, apparently tall, only the cauline leaves seen, these lanceolate or elliptic-lanceolate, 3–5 inches long, very acute, subsessile, glabrous, the margins scabrous-serrulate by short stout sharp-pointed hairs: calyx campanulate, glabrous, except the hirsute-ciliate

triangular lobes, and these only half as long as the tube: corolla nearly ¾ inch long, the cylindric tube little exceeding the calyx, the limb large, amply funnel-form.

A very strongly marked species, both as to foliage, the merely toothed calyx, and the remarkably long and ample limb of the corolla. The only specimens seen are in the U. S. Herbarium, and purport to have been collected somewhere in Arizona, by Dr. Palmer, in 1869.

KUMLIENIA HYSTRICULA, Greene.

ARCTERANTHIS COOLEYÆ. Greene.

CYRTORHYNCHA RANUNCULINA. Nuttall.

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WASHINGTON, D. C.

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## New Species of Eriogonum.

E. ANEMOPHILUM. Low, cæspitose, the short branches of the caudex woody and very leafy, the whole herbage somewhat softly but densely white-tomentose: leaves obovate to suborbicular, a half-inch long or less, obtuse, some abruptly tapering to the petiole, this about a half-inch long: scapes erect from a slightly decumbent base, mostly about 3 inches high, bearing a rather large terminal cluster of crowded involucres, these, even to their short erect teeth or lobes, embedded in a looser white wool: perianths cream-color, fading reddish, rather broad, not stipitately narrowed, deeply cleft, the segments broad throughout, somewhat, quadrate-obovate, obtuse or emarginate: filaments and ovary glabrous.

On bleak windy summits at the northern end of the West Humboldt Range, Nevada, collected by the author in July, 1894. Related to *E. Kingii*, but of different habit, inflorescence and floral structure, and somewhat intermediate between that and *E. ovalifolium*.

E. DUMOSUM. Near *E. umbellatum*, but a large upright shrub 5 or 6 feet high, all the ultimate branches, the peduncles and both faces of the leaves white-tomentose: leaves obovate, obtuse or acutish, mostly less than an inch long, on short and rather stout petioles: stout peduncles nearly a foot long: umbel simple, its rays 5 or 6, stouter and relatively shorter than in *E. umbellatum*, the involucres and flowers rather larger than in that species, in structure not differing essentially, but the achene very prominently angled.

A probably somewhat local species of the American Valley, Plumas Co., California, collected and distributed by Mrs. Austin as "*E. umbellatum*," it having been so identified for her by Mr. Watson. But *E. umbellatum*, even as growing

in northeastern California, is always a low cæspitose undershrub seldom or never a foot high; and this large shrub, with its peculiar pubescence, should not have been referred to that species. Meanwhile, in its very prominently angled achene *E. dumosum* has an excellent technical character.

E. ARIDUM. Near *E. umbellatum*, of the same habit, though smaller in all its parts and rather more slender; the foliage less tomentose, but decidedly more equally and permanently so on both faces of the leaf: the peduncles more numerous and more slender, 5 to 10 inches high, the umbels simple, about 5-rayed (3 to 6) and the rays short: perianths of a dull cream-color (as in *E. subalpinum*) decidedly narrower than in the allied species, the segments narrowly oblong-cuneiform, the outer and inner ones much alike: anthers oblong; filaments strongly villous-ciliate about midway: achenes with rather narrowly lanceolate face, the angles retrorsely hairy at summit.

Peculiar to the arid foothills above the Humboldt Wells in eastern Nevada. A near relative of *E. umbellatum* and *E. subalpinum*, having the mode of growth characteristic of the former, the pale flowers of the latter; quite distinct from both in floral character, and belonging to a dry desert region where neither of those species occurs or would be expected.

E. LUTEOLUM. Near *E. gracile* and *molestum*, annual, slender, usually more than a foot high, repeatedly and rather widely trichotomously and dichotomously branching, with the small involucres solitary in the forks, and virgately arranged on all the ultimate branchlets: leaves mostly at base of the stem, small, round-ovate or orbicular, densely white-woolly beneath, glabrate above, less than a half-inch long, on petioles of more than an inch; the stem and branches green and glabrous: involucres many-flowered, small, prismatic, a little widened upwards, glabrous or with some villosity between the short erect mucronate teeth: perianth light-yellow, $\frac{3}{4}$ line long, the outer segments cuneate-obovate,

obtuse, the inner narrower, scarcely longer: filaments glabrous: rounded body of the achene surmounted by a stout trigonous muriculate beak.

Collected by the author on dry hills of Napa Co., Calif., July, 1891; referred to *E. gracile* in the *Flora Franciscana*, as a yellow-flowered form. The same appears to have been collected by Mr. Bioletti at Jackson, Amador Co., in 1893, and distributed by him for *E. virgatum*.

E. COGNATUM. Near *E. tripodum;* the lignescent short leafy branches of the caudex closely tufted: leaves oblong-obovate, obtuse, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, tapering to a petiole of 1 or 2 inches, white-tomentose beneath, glabrous above: peduncles several from each branch of the caudex, 6 to 10 inches high, naked below, but with an involucrate whorl of leaves above the middle, and then trifurcate, one of the branches shorter, bearing a single involucre, the other two once or twice bifurcate or trifurcate, and with a whorl of bracts subtending each fork: involucres turbinate, the 5 or 6 ovate teeth reflexed, the whole together with the pedicels subtomentose: perianths yellow, narrowed to a rather short stipitiform base, the segments obovate-oblong: filaments densely woolly at the very base only.

Open woods about the base of Mt. San Francisco, and about Flagstaff, in northern Arizona; collected by the author in July, 1889, and at the time supposed to be *E. stellatum*, a species which has been misunderstood. Its only near relative is the middle Californian *E. tripodum*, some forms of which, particularly the one inhabiting Mt. Hamilton, I had erroneously referred to *E. stellatum*.

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## THE HOP TREFOILS.

There is probably no other small group of papilionaceous plants the several members of which have so exercised the minds of critical and careful botanists in Europe as this one,

which we have at the outset somewhat evasively, but according to old English usage, denominated the Hop Trefoils.

The various difficulties which systematists have encountered in attempting to classify these plants arrange themselves naturally and conveniently under three headings: first, the generic status of the group; secondly, the natural limits of the species; and thirdly, the identification of each of the four species named by Linnæus.

As for their generic status, the author named had them in *Trifolium*, a consideration of no great weight, if we but bear in mind that the series of genera jumbled together by him under that name begins with *Melilotus* and ends with *Stylosanthes*. The better systematists of a generation or two before him had expressed some diversity of opinion as to where these small trifoliolate papilionaceæ ought to be placed as a natural group; some authors ranging them under *Trifolium*, some under *Melilotus*, some under *Lotus*, some under *Medicago*, while certainly not less than two original and influential authors had named them as constituting a separate and distinct genus. Rivinus in 1691 placed them in generic rank under the name *Lupulinum*, and Micheli in 1729 included them in his proposed new genus *Trifoliastrum*. And since Linnæus' time there have been made a number of open protests, and by most able botanists, against the treating of the Hop Trefoils as congeneric with such plants as *Trifolium pratense* and its allies. Systematists of no less renown than Lamarck (1778) and Desfontaines (1798) referred the plants to *Melilotus* rather than *Trifolium*. Desvaux in 1827 expressed the opinion that they ought to constitute a genus, assigning the name CHRYSASPIS. Three years later C. B. Presl, perhaps unaware of Desvaux's work, designated them as a genus which he called *Amarenus*.

From true *Trifolium*, that natural group of which the Red or Meadow Clover is typical, these plants differ very strikingly. No person with mind unwarped by the pedantries of the school-master botany of the last century would say

that such plants were closely allied to Red Clover. Their aspect is far more that of small Sweet Clovers, *i. e.*, *Melilotus;* or perhaps *Medicago*, rather; and natural botany therefore demands that to one or the other of these genera they shall be referred, unless they are to constitute a genus of their own. They have not the curved or coiled pods of *Medica* or *Medicago*, nor the deciduous petals of *Melilotus*. Moreover, in their whole bearing there is an indefinable something which is different from *Melilotus*. The floral structure is peculiar, and remarkable. The banner of the corolla is not only singularly furrowed, or at least striated; the manner of its folding up after anthesis is exactly contrary to that which it holds in the bud. In æstivation this organ is conduplicate, just as in other papilionaceous corollas; but after flowering, instead of resuming its first folding, it becomes induplicate, or at least incurved, taking on a folding, as I said, exactly contrary to that which it had in the first place. It is this which gives to the mature spike or raceme that curiously imbricated aspect which is universal in this genus, and unknown in any of its allies. There are scores of papilionaceous genera, admitted even by Bentham, which have less in habit and less of character to mark them than has CHRYSASPIS. And even Linnæus places the group upon an exact equality with *Melilotus*, as to rank, naming the groups respectively the Meliloti and the Lupulina, as if seeing that if the Meliloti were to be a genus, so were the Lupulina.

I had for some time been intending to emphasize my opinion of this group as a good genus, not doubting that Presl's name was the one to be taken up, when, on looking over the pages of Desvaux's *Flore de l'Anjou*, I discovered a group-name for these plants which is not in any of the bibliographies or nomenclators, and which, at first glance, I took for a mere subgenus-name. Desvaux in his work follows the fashion set by Lamarck and De Candolle, of writing all Latin plant names as mere synonyms, as it were,

while the foremost name of every genus and species is the French name. CHRYSASPIS is even printed in the most modest of type, and after the name *Trifolium*, as if meant for the name of a subgenus merely. But when the author proceeds to name the first species *Chrysaspis campestris*, Desv., all doubt is removed as to his intention of creating a genus-name. As this antedates Presl's *Amarenus* by only three years, it seems most probable that Presl knew nothing of what Desvaux had proposed in his small local Flora; and as for the *Index Kewensis*, we are no more called upon to account for this omission than for hundreds of others.

All the species and varieties of CHRYSASPIS are of the Old World as exclusively as are the species of *Melilotus* and *Medicago;* therefore questions of the exact limits of species and varieties are to be settled by Old World botanists. Several of them have, however, long been naturalized in North America; though no American appears to have given them any study, and those we have are for the most part wrongly identified by the authors of our books and catalogues.

1. C. AUREA. *Trifolium aureum*, Pollich, Palat. ii. 344 (1777). *T. agrarium*, Schreb. in Sturm, Deuschl. Fl. (1804); Britt. & Br. Ill. Fl. ii. 275, not Linn. *Amarenus aureus*, Fourr. Ann. Soc. Linn. Lyon. xvi, 362 (1868). This, if not the largest of all the members of its genus, is the largest of those that have become established in this country. About Washington it is commonly a foot high, quite erect, sparingly branched, with showy spikes, the flowers of which, in the dry state, are only light-brown. It is readily distinguished from *C. agraria* by its leaflets, which are long and narrow, only slightly denticulate, the terminal one being sessile like the others. The calyx-teeth in this are not villous, but bear at their very tips one or more long slender hairs; but these are hardly to be seen except at or before the flowering, for they are quite deciduous, so that upon the older calyxes no trace of them remains. It is not improb-

able that this excellent species was confused by Linnæus with his *T. agrarium;* but it is very certain that it is not his type. This will more clearly appear under the bibliography of the next species.

2. C. AGRARIA. *Trifolium agrarium*, Dod. Pempt. 566 (1583); Linn. Sp. 772 (1753), as to name and figures cited, not of Schreb. in Sturm (1804). *T. campestre*, Schreb. l. c. *Chrysaspis campestris*, Desv. Fl. Anjou, 338 (1827). *Amarenus agrarius*, C. Presl. Symb. i. 46 (1830). *Melilotus lupulina*, Lam. Fl. Fr. ii. 593 (1778), excl. var. Linnæus does not appear to have known this plant except by the descriptions and figures of earlier authors. His account of the calyx indicates that he mistook *C. aurea* for the same as *T. agrarium* of Dodoens. His diagnosis, short and imperfect as it is, determines nothing; but the positive identification of *T. agrarium*—a name not proposed by him, but only adopted from Dodoens and others—is made by reference to the figures by Dodoens and by Vaillant which he cites. These figures remove all doubt that the plant of the broad and short dentate leaflets, the terminal one very distinctly petiolulate, etc., etc., is the one which must bear the specific name *agraria*. Pollich, Savi, Presl—all eminent specialists in the study of these plants, and men thoroughly competent in bibliographical questions—found this conclusion unavoidable.

3. C. SPADICEA. *Trifolium spadiceum*, Linn. Fl. Suec. 2 ed. 261 (1755); Sturm, l. c. *Amarenus spadiceus*, Presl, l. c. (1830). Species with the habit of *C. aurea*, but differing most obviously by its spikes of dark-brown rather than yellow flowers. Its leaflets are broader, those of the lower part of the stem quite obovate, the others obovate-oblong, all notably dentate, and all three are distinctly but equally short-petiolulate. The calyx-teeth in this are quite permanently villous-hairy. The banner is here less striate and also less notably inflexed than in most other species. Linnæus gave recognition to this species in 1753, but inadver-

tently assigned it a trivial name, *T. montanum*, which he afterwards found untenable as being homonymous; see Sp. Pl. pp. 770 and 772.

4. C. BADIA. *Trifolium badium*, Schreb. in Sturm, l. c. (1804); Savi, Obs. 113 (1810). *T. spadiceum* in part of Linn. Fl. Suec., but not as to the type. *Melilotus lupulina*, var. Lam. Fl. Fr. ii. 593 (1778). *Amarenus badius*, Presl, l. c. (1830). Evidently related to *C. spadicea*, and confounded with that species by Linnæus; but readily distinguished by its short and subglobose heads, and a banner far longer in proportion to the other petals. Its flowers change only to a chestnut color, not to a dark brown; and its leaflets are all sessile. Linnæus probably did not know the plant, and he erroneously cited a classic figure of it—Barrelier, t. 1024—as representing his *T. spadiceum*. But it is agreed by all European students of these plants that Barrelier's figure represents the present species. Nor can it be successfully contended here, as in the case of *C. agraria*, that because of Linnæus' having cited this figure the name *spadicea* must be applied to this plant; for the Linnæan description, and even the name *spadicea*, are distinctly diagnostic of the northern plant of the elongated and dark-brown spikes.

5. C. PROCUMBENS, Desv. Fl. Anjou, 338 (1827). *Trifolium procumbeus*, Linn. Sp. 772 (1753). *Amarenus procumbens*, Presl, l. c. (1830). This appears to be the most common of the species which have established themselves in North America, and is the only one which has hitherto been accredited as naturalized on the Pacific coast. But *C. agraria* is certainly frequent in western Washington, and even forms a part of the "*T. procumbens*" of Mr. Howell's *Flora*, as copious specimens sent me by him demonstrate.

6. C. DUBIA. *Trifolium dubium*, Sibth. Fl. Oxon. 231 (1794). Also naturalized on both slopes of our continent, according to Britton & Brown, Ill. Fl. 275.

## Corrections in Nomenclature.—II.

It is manifest that the name Anthanotis of Rafinesque enjoys the right of priority over Elliott's *Podostigma*, and must supersede it. Both were published in 1817, the former in the *Flora Ludoviciana*, p. 52, the latter in the *Sketch*, p. 326. Rafinesque's first allusion to Elliott's work is made under the "Additions," or supplementary pages done after the body of the work had been completed, and, presumably, issued. The reference to Elliott, in Fl. Ludov., p. 149, indicates a kind of superficiality in reading, and a carelessness of writing which are often characteristic of Rafinesque. He says, "Mr. Elliott has given to the genus *Anthanotis* the name *Acerates*;" but this is not true. It may well be that Rafinesque had it in mind to include all the *Acerates* species in his *Anthanotis*, but he never named them so, and his *Anthanotis* has for its type the same species which Elliott took for the type of *Podostigma*, namely, the *Asclepias pedicellata* of Walter; and both authors added to the genus the very different *A. viridis*, Walt., which is the type of *Asclepiodora*, Gray. Since, therefore, Elliott's asclepiads were not out until the *Flora Ludoviciana* was finished, as to its main part, it seems to me that, instead *Podostigma pubescens*, Ell., one must write Anthanotis pedicellata (Walt.), Raf.

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Euphorbia Rafinesquii. *E. hirsuta*, Wiegand in Bot. Gaz. xxiv. 50 (1897). The specific name *hirsuta* is here precluded by either one of the following: *E. hirsuta*, Schur (1853), and *E. hirsuta*, Kitaibel (1866). It is also unsafe, in dealing with eastern species of *Euphorbia*, to ignore the fact that Rafinesque published two or three, one at least from the very region which the present plant inhabits; the one I have in mind as possibly identical with this of Mr. Wiegand being also under an untenable specific name.

That group of papilionaceous plants—species of *Astragalus* according to Tournefort and Linnæus—on which De Candolle, as late as 1802, established the genus *Oxytropis*, had been much earlier indicated as distinct from *Astragalus*. The exactly typical *Oxytropis*, according to De Candolle, is the *Astragalus montanus* of Linnæus. Tournefort, both in 1694 and in 1700, put it down as a quite dubious *Astragalus*, "*Astragalus montanus* of some authors, an *Onobrychis* according to others."[1] As early as 1723 Michel Angelo Tilli placed this one species in the rank of a genus under the name *Astragaloides*. Necker in 1790, associating other allied species with it, assigned the genus a new name, and one which was admissible under the Linnæan code, which the Tillian *oides* name was not. Only twelve years after this, De Candolle comes out with a beautiful folio upon *Astragalus* and its allies, in which Tilli's and Necker's genus appears, as if it were an absolutely new one, and under the name of *Oxytropis*. De Candolle was excusable in passing by the untenable name imposed by Tilli; but as much cannot be said—indeed nothing can be said—in extenuation of his treatment of Necker, whom he passes by in silence.

Dr. Otto Kuntze seems to have been first to attempt the doing justice to Necker in respect to the genus in question. In the *Revisio Generum* he writes up all the *Oxytropis* species under Necker's *Spiesia* which he says is the equivalent of De Candolle's genus of a twelve-years' later date. And I, not having had occasion to use any of Kuntze's combinations under *Spiesia*, and not doubting the correctness of his statement that it is the same as *Oxytropis*, have been gratified, as an advocate of priority, to see that in several recent publications, *Spiesia* was being received instead of the later and presumedly synonymous *Oxytropis*. But, it having quite lately fallen in my way to renew long interrupted studies of *Astragalus* and its allies, I have examined Necker's pages relating to these plants, and have found Dr. Kuntze

[1] Tournef. Elemens, i. 329; Inst. i. 416.

far from correct in his assertion that *Spiesia* equals *Oxytropis*. Necker's *Spiesia* is characterized as having unilocular legumes, and is said to include only certain species of *Phaca* published as new by Pallas. But De Candolle's *Oxytropis* is made to rest primarily upon old Tournefortian and Linnæan species of *Astragalus* having bilocular legumes; *A. montanus*, Tourn., Linn., *et al.* being placed as typical for the genus. And these plants Necker also recognizes as distinct from *Astragalus*, and from *Spiesia* as well, and assigns them the generic name ARAGALLUS; definitely indicating the 2-celled legumes as the essential mark of the genus, as compared with *Spiesia*.

I do not think Dr. Kuntze can have given to Necker's pages upon this topic anything more than the most casual and inattentive reading. Necker, it must be conceded, is not always easily intelligible. His conceptions of genera are very original, but therefore the better deserving careful consideration; but he has his own peculiar modes of expression, and makes use of a terminology quite his own; so that special study of this author, as an author, must be made, if one is to identify all his genera. But in treating of *Astragalus* and its allies he has quite freed himself from obscurity by citing definitely the species which compose his several genera. If no one has hitherto claimed to identify *Aragallus*, it must have been through sheer inattention to what the author distinctly said. On page 12 of the *Elementa*, volume III, under *Astragalus*, he observes that this genus has 34 species, and that the remaining *Astragali* given in the fourteenth edition of Linnæus' *Systema Vegetabilium* "belong to the next genus," that is, to ARAGALLUS. In the work to which he refers, we find the Astragali divided into four groups according to habit, that the third group is that which has the habital features ascribed by Necker to ARAGALLUS, and that it embraces all those Linnæan species, *A. montanus*, *Uralensis*, *campestris*, *verticillaris*, etc., which De Candolle chose as the strongest representatives of *Oxytropis*.

By a similar investigation of Pallas' work, in the light of Necker's reference to it, and his definition of *Spiesia*, we become assured that this genus was made up of Pallas' *Phaca microphylla*, *lanata*, *oxyphylla*, *prostrata*, *muricata*, and *myriophylla*. De Candolle, it is true, includes them all in *Oxytropis*, as having the habit of the genus, and one of the characters; but he places them last in the series, on account of their one-celled pods; the typical group, embracing by far the greater proportion of the species, having their pods two-celled, and constituting, as I have said, Necker's ARAGALLUS.

Necker's delimitation of these genera was done in full accordance with the principles of Linnæus, who held *Astragalus* and *Phaca* as distinct on the characters, respectively, of bilocular and unilocular legumes. If *Astragalus* and *Phaca* are distinct, so are *Aragallus* and *Spiesia*. This whole question seems to have been opened anew in the *Illustrated Flora* of Britton and Brown. I am in so far favorably disposed toward the separation of *Phaca* and *Astragalus* as to be unwilling to express here the opinion that *Spiesia* and *Aragallus* are to be united. But if they are, ARAGALLUS as having the precedence is the name to be maintained. I shall here rename only some of the more typical Old and New World species.

### * *Species of the Old World.*

A. MONTANUS. *Astragalus montanus*, Linn. Sp. 760 (1753). *Phaca montana*, Crantz, Austr. 422 (1769). *Oxytropis montana*, DC. Astr. 66 (1802). *Spiesia montana*, O. Ktze. Rev. Gen. i. 207 (1891).

A. URALENSIS. *Astragalus Uralensis*, Linn. l. c. 761. *Oxytropis Uralensis*, DC. l. c. 68. *Spiesia Uralensis*, O. Ktze. l. c.

A. GRANDIFLORUS. *Astragalus grandiflorus*, Pall. Astr. 57. t. 46 (1800). *Oxytropis grandiflora*, DC. l. c. 71. *Spiesia grandiflora*, O. Ktze. l. c. 206.

A. SONGARICUS. *Astragalus Songaricus*, Pall. l. c. 63, t. 51. *Oxytropis Songaricus*, DC. l. c. 73. *Spiesia Songarica*, O. Ktze. l. c. 207.

A. CAMPESTRIS. *Astragalus campestris*, Linn. Sp. 761. *Oxytropis campestris*, DC. l. c. 74. *Spiesia campestris*, O. Ktze. l. c. 206.

A. FŒTIDUS. *Astragalus fœtidus*, Villars, Prosp. 42, t. 27 (1779). *Oxytropis fœtida*, DC. l. c. 75. *Spiesia fœtida*, O. Ktze. l. c.

A. VERTICILLARIS. *Astragalus verticillaris*, Linn. Mont. 275 (1771). *Oxytropis verticillaris*, DC. l. c. 88.

** *Species of North America.*

A. SPLENDENS. *Oxytropis splendens*, Dougl. in Hook. Fl. i. 147 (1833). *Spiesia splendens*, O. Ktze. l. c. 207.

A. ARCTICUS. *Oxytropis arctica*, R. Br. App. Parry's Voy. 278; Gray, Proc. Am. Acad. xx. 4 (1884).

A. MERTENSIANUS. *Oxytropis Mertensiana*, Turcz. Bull. Mosc. 1840, p. 68; Bunge, Oxytr. 116; Gray, Proc. Am. Acad. l. c. Native of both continents, along the coasts of Behring Sea and Straits.

A. PARRYI. *Oxytropis Parryi*, Gray, Proc. Am. Acad. xx. 4 (1884). A small and rare species of the middle Rocky Mountains.

A. VISCIDUS. *Oxytropis viscida*, Nutt. in T. & G. Fl. i. 341 (1838); Gray, Proc. Am. Acad. l. c. Rocky Mountains.

A. LEUCANTHUS. *Astragalus leucanthus*, Pall. Astr. 59, t. 47 (1800). *Oxytropis leucantha*, Pers. Syn. ii. 331 (1807); Gray, l. c. Of extreme northwest America and northeast Asia.

A. MONTICOLA. *Oxytropis monticola*, Gray, Proc. Am. Acad. xx. 6 (1884). Rocky Mountains of Wyoming, thence northward into British America.

A. LAMBERTI. *Oxytropis Lamberti*, Pursh, Fl. ii. 740 (1814); Bot. Reg. t. 1054. Common over a great extent of the Rocky Mountain country north and south. Legumes small, for the plant, and subterete.

A. SERICEUS. *Oxytropis sericea*, Nutt. in T. & G. Fl. i. 339 (1838). Rocky Mountains of Colorado and Wyoming. Legumes larger than in the last, and perceptibly obcompressed.

A. BIGELOVII. *Oxytropis Lamberti*, var. *Bigelovii*, Gray, Proc. Am. Acad. xx. 7 (1884). Plains of southeastern Colorado and adjacent New Mexico. Differs from all the foregoing by green and glabrate herbage, and thin distinctly stipitate pods.

A. LAGOPUS. *Oxytropis Lagopus*, Nutt. in T. & G. Fl. i. 340 (1838). Beautiful dwarf tufted or matted species of the high plains of Wyoming and Montana.

A. NANUS. *Oxytropis nana*, Nutt. l. c. Habitat of the last.

A. BELLII. *Spiesia Bellii*, Britton, Can. Rec. Science, 148 (1894). A beautifully distinct and somewhat recently discovered species of the Hudson Bay region.

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## NEW OR NOTEWORTHY SPECIES.—XIX.

HEDYSARUM CARNOSULUM. Stem low and flexuous, scarcely longer that the fruiting raceme, the whole plant barely a foot high: leaves short-petioled, the leaflets 9 to 11, pubescent beneath, glabrous above, pale green, somewhat succulent, with faint midnerve and no veins, those of the lowest leaves elliptic, of the upper linear-oblong, all acute: long racemes of

rose-purple flowers short-peduncled: subulate calyx-teeth rather longer than the short tube: loments large, usually of 2 or 3 joints, these conspicuously margined and with sharply raised and rather closely parallel transverse rugosities which are either distinct throughout or which run together into a few reticulations over the seed.

Common in clayey soil about the mouth of the Cañon of the Arkansas, in southern Colorado. Hitherto referred, though very carelessly, to *H. Mackenzii;* but very distinct from that and all other species of this country by its subsucculent herbage and veinless leaflets; and the conspicuous close transverse lineation of the loment is an important technical character.

HEDYSARUM LEUCANTHUM. *H. Mackenzii*, var. *leucanthum*, Greene, Pitt. ii. 294. Stems tufted, scarcely a foot high: oblong leaflets rather remote, silvery-canescent beneath, glabrate above: peduncles elongated and subscapiform, surpassing the leaves and stem: racemes very short and dense, not longer than broad: flowers large, white: subulate-lanceolate segments of the calyx decidedly longer than the tube, the whole calyx silvery-canescent: fruit unknown.

Since the publication of this high northern plant as a variety of *H. Mackenzii* I have been assured by my friend Mr. James M. Macoun, who has seen it growing, that it is, as its peculiar habit indicates, a thoroughly distinct species.

TRIFOLIUM CALOPHYLLUM. Annual, slender, branched from the base and decumbent or depressed, the branches about $1\frac{1}{2}$ feet long, the whole herbage flaccid, deep green and glabrous: leaves long-petioled, the leaflets extremely variable; the very lowest barely 2 lines long, cuneate-obcordate, spinulose-denticulate; those of the middle part of the stem an inch long or less, from obovate to rhombic-lanceolate and lanceolate, usually sinuately lobed and the lobes spinulose-dentate, sometimes not lobed but doubly dentate, the uppermost elliptic-lanceolate to linear-lanceolate, all

doubly spinulose-serrulate: heads on slender peduncles much surpassing the leaves, ½ inch broad or more, the corollas dark purple tipped with lilac: involucre small for the head, setaceously many-cleft: calyx with short campanulate 20-nerved tube and very long segments, these with almost deltoid broad base abruptly narrowed to a long straight setaceous awn.

Native of Kern County, California, and southward; related to the more northerly *T. trilobum*, but very distinct; when well grown, exhibiting the greatest diversity of most beautiful foliage.

TRIFOLIUM MAJUS. *T. obtusiflorum*, Greene, Fl. Fr. 31, not of Hooker. *T. obtusiflorum* var. *majus*, Howell in Herb. I long since gave a thorough diagnosis of this plant, in the place cited, believing it to be Hooker's *T. obtusiflorum*. But subsequent research at Kew taught me that the real *obtusiflorum*, as to the specimen collected by Douglas, and therefore typical, is the plant which, on the page referred to, I published as new, under the name of *T. roscidum*. This last, then, is but a synonym. Hooker's figure in the *Icones* was made from the poorest branchlet of a good large specimen, and fails to show any trace of the obvious pubescence. Such figures, completely falsifying the species which they purport to represent, ought not to be admitted as constituting publication; but, if we are to follow the questionable practice of allowing the herbarium specimen to decide the question, *T. roscidum*, under which name the species was really first described, will subside. The species is far more common than *T. majus*, here named as new; and my line in the *Flora Franciscana* "originally from Monterey, *Douglas*," should be erased; for it is true only of the real *obtusiflorum*, my *roscidum*.

TRIFOLIUM MINUTIFLORUM. Annual, very slender, glabrous, the numerous branches decumbent, a few inches to almost a foot long: leaflets ½ to ¾ inch long, the lowest exactly linear, truncate or emarginate, the others oblong-linear and abruptly acutish, all somewhat serrately and very evenly denticulate: peduncles filiform, much longer than the leaves: heads not much more than 2 or 3 lines broad in flower; involucre parted into 6 or 7 oblong entire lobes: calyx-teeth subulate-lanceolate, herbaceous almost throughout: corollas moderately inflated in age.

An interesting species, allied to *T. truncatum* and *T. hydrophilum*, which latter it agrees with in having the leaflets of its earliest leaves narrower than those of the later ones, in which respect these two differ from all other West American clovers. This one is of southern California and Guadalupe Island. Mr. Orcutt distributed it as "*T. gracilentum*."

TRIFOLIUM POLYODON. Annual, glabrous, the rather firm and not flaccid branches nearly prostrate, 1 to 2 feet long: lowest leaves on long petioles, those of the uppermost very short: leaflets of all obovate, of the lowest broadly so, of the upper narrower, and these ¾ to 1 inch long, all finely and sharply denticulate: peduncles short and firm, seldom surpassing the leaves: heads many-flowered, about ¾ inch broad; involucre of few broad setaceously multifid lobes: corollas small for the plant, dull purple: short calyx-tube with about 10 distinct straight nerves and as many finer ones which branch above and form a few meshes; the teeth elongated and mostly setaceously 3-cleft.

Plentiful in moist uplands along streamlets and springy places at Pacific Grove near Monterey, Calif.; collected by the author 27 May, 1895. A large and very distinct one of the annual species of the involucrate group, bearing much likeness to the equally rare or local *T. appendiculatum*. I am apprehensive it may prove identical with the plant of

Douglas which was placed as the third variety of *T. heterodon* in Torrey & Gray, p. 318. But the true *T. heterodon* is a perennial of the far Northwestern coasts, and very unlike this.

TRIFOLIUM PHÆOCEPHALUM. Annual, branched from the base, the branches very slender and weak, 2 inches to more than a foot long, only very sparingly leafy: leaflets from round-obovate and retuse to elliptic and even lanceolate and acute, $\frac{1}{4}$ to $\frac{3}{4}$ inch long, minutely denticulate: peduncles almost filiform, 2 to 4 inches long, far surpassing the very short-peduncled leaves: involucres reduced, lobed and cleft, but not equalling the calyxes of the large and showy flowers, these rather few in the head, but the dark-purple corollas $\frac{1}{2}$ inch long, nearly four times the length of the calyx; this with very simply and prominently 10-nerved tube, and much longer lanceolate-subulate aristate-pointed dark-purple teeth.

A graceful and beautiful species of the foothills of the Sierra Nevada, California; every part of the plant slender and delicate, except the apparently large heads; but these only seemingly so, by reason of the uncommon dimensions of the corolla for a member of the *T. variegatum* group. In small plants the heads are often only from 2 to 4-flowered. I have specimens from Butte County, by Mrs. Austin, from Amador County, near Jackson, by Geo. Hansen, and also from Kern County, by Palmer.

TRIFOLIUM GEMINIFLORUM. *T. pauciflorum*, Loja. in Nuov. Giorn. Bot. xv. 183, not of Nuttall. I shall not here reproduce Prof. Lojacono's excellent diagnosis of this very distinct subalpine Californian clover which he mistook for Nuttall's *T. pauciflorum* and which others have confused with *T. variegatum*. Very nice specimens of the typical form with heads mostly 2-flowered have been distributed by Mrs. Austin from Lassen's Peak, and by Mr. Sonne from near Donner Lake. At decidedly lower than subalpine situations in

Amador County both Mr. Hansen and I have collected it in an enlarged form, with from 5 to 15 flowers to the head, and otherwise somewhat closely verging upon *T. variegatum*, yet readily distinguishable from that by its far more slender habit, almost capillary peduncles, and different calyx, as well as whitish corollas. It is also found in the more elevated parts of the Coast Range northward. But it is completely separated geographically from the real *variegatum*, which is a lowland plant of the district lying toward the sea, in Oregon and Washington.

TRIFOLIUM PUSILLUM. Annual, much branched from the base and decumbent, barely 2 inches high, the branches filiform and peduncles capillary: leaflets all broadly obcordate. ½ to 1 line long, dentate by 2 to 4 triangular teeth on either margin: capillary peduncles ½ inch long; involucre reduced to a single several-cleft lobe and somewhat unilateral, 1–2-flowered: calyx-teeth scarcely longer than the tube, oblong-ovate, abruptly acuminate to a short aristiform tip: corolla about thrice the length of the calyx, white, with purple-tipped wing petals.

Known only from the Yosemite Valley, where it was collected by Dr. C. C. Parry in 1881, and distributed by him as *T. monanthum;* also mistaken for that species by Marcus Jones, who, in publishing *T. multicaule*, took the present plant for *T. monanthum* on the authority of Sereno Watson. It is referred to by me in the *Flora Franciscana*, p. 32, as a "one-flowered state of *T. variegatum*," what I then understood as *T. variegatum* being the plant now published as *T. geminiflorum*, with which I have more than once tried to unite *T. pusillum* as a mere variety; but its leaves, its calyx-lobes, and its mode of growth are too radically different.

TRIFOLIUM DIANTHUM. Very dwarf perennial, the rather stoutish stems scarcely an inch long, surpassed by the upper petioles and peduncles; herbage deep green and very glabrous: leaflets obcordate or obovate, about ¼ inch long,

rather sharply and mucronately dentate: peduncles shorter than the leaves, bearing an involucrate pair of purple flowers; involucre large for the plant, lacerately cleft: calyx with 10-nerved tube shorter than the teeth, these with oblong-lanceolate body tapering to a stoutish aristiform apex: corolla twice the length of the calyx, the petals purple tipped with white.

Native of Vancouver Island, where it was collected by Mr. John Macoun, in 1893. Analogous to *T. monanthum*, and more reduced than that in size, the involucres rarely one-flowered; but still not very closely related to the Californian plant, the herbage being deep green and perfectly glabrous; the calyx wholly different in its proportions. It was distributed by Mr. Macoun under the name *T. pauciflorum*, perhaps because the name is well applicable.

TRIFOLIUM ULTRAMONTANUM. Near *T. variegatum*, but more slender, yet not depressed, often quite erect, only sparingly branching, 8 to 18 inches high: lowest leaves with exactly obcordate leaflets about $\frac{1}{4}$ inch long, those of the upper portion of the stem twice as large, cuneate-obovate, retuse or emarginate, all inconspicuously denticulate: peduncles very slender, of more than twice the length of the short-petioled leaves: heads small, only about 4 lines broad; involucre of 5 or 6 broad and short sharply laciniate lobes: campanulate calyx-tube scarious, 10-nerved, the deltoid-ovate to ovate-lanceolate teeth green-herbaceous, tapering to a short awn, the whole tooth or segment not longer than the tube: pods exceeding the calyx, 2-seeded: seeds green, obtusely subtrigonous.

Plentiful among grasses and sedges in the region of the middle Humboldt River, Nevada. A perfectly distinct ultramontane homologue of *T. variegatum* of the far northwestern seaboard. Its more slender yet quite wiry stems, broad short leaflets, pale flowers and short broad-toothed calyx characterize it fully. Common though it is in the

region which it inhabits, I find it in none of the herbaria, and suppose that I alone have collected it.

TRIFOLIUM SUBSALINUM. Also near *T. variegatum*, seeming much stouter, but the stems hollow, flaccid and weak, prostrate, from a few inches to two feet long: leaflets all obovate or obovate-oblong, mostly about ¾ inch long, obtuse, none emarginate, obviously serrulate: peduncles slender, twice as long as the leaves: heads nearly ½ inch broad; laciniate involucre only slightly lobed: calyx much as in the last, but the teeth almost wholly scarious: pods not exserted: seeds more elongated, and darkened in color by more copious purple dots.

This is another ultramontane ally of *T. variegatum;* and while more like that species in the characters of its leaflets and calyx, it is far removed from it by its thick but soft hollow stems and branches. By this character it has misled some of the authorities. Mr. Watson sometimes mistook it for "*T. involucratum*," though its root is certainly annual. Its habitat is the muddy shores of subsaline ponds and pools, in various parts of the Great Basin from Western Nevada to Wyoming, and it is in the herbaria from many collectors.

The group of which *T. tridentatum* is typical will ultimately prove an extensive one. Lindley's original diagnosis of the type is vague enough to cover all plants having the tridentate calyx-segment. Very notable segregates are the *T. obtusiflorum* and *T. majus* remarked upon already in this paper. Another most excellent species is

T. ACICULARE, Nutt. in T. & G. Fl. 319. Its perfect validity as a species was recognized by me while studying Nuttall's type, in the British Museum in 1894; and I had in my possession fine specimens of recent collection from Santa Barbara Co., Calif., as well as one from San Bernardino Co., with comments by Mr. Parish upon it as distinct

from *T. tridentatum*. Its geographic range is quite extensive, and, as I now know its distribution, it should have had a place in the *Bay Region Manual*, for several of my former students gathered it in Contra Costa Co., and it is found all the way from Monterey and Amador counties southward.

Another good segregation from Mr. Watson's *T. tridentatum* is

T. WATSONII, Lojacono. This belongs to the interior of California northward, and seems to be more restricted in its range than *T. aciculare*.

T. SCABRELLUM, Greene, Pitt. i. 159., is to be maintained as originally defined. Its reduction to the rank of a mere variety came about through my having attempted to refer to it a much more common plant which was not to be confounded with *T. tridentatum*, and which has some points of agreement with *T. scabrellum*. This I now name and define as follows:

TRIFOLIUM TRIMORPHUM. Annual, slender, branched from the base and decumbent, the branches ½ to 1 foot long; herbage light green and glabrous; leaflets of three distinct forms on each plant; the lowest very small and obcordate, barely 2 lines long, the middle cauline twice as long, linear and truncate, the upper oblong-linear or oblong, acute, ½ to ¾ inch long, all except the lowest (these merely dentate) serrulate: slender-peduncled heads about ¾ inch broad; involucre cleft to the middle into alternately long and short subulate segments: corollas flesh-color with a purple center; calyx evenly and strongly 10-nerved, the oblong-ovate segments mostly 3-dentate, shorter than the tube: pods little longer than the calyx-tube, 2-seeded.

Known only from the counties of Alameda and Contra Costa in middle California, where it inhabits rather flat open grounds. It is plentiful in the lowest parts of the Livermore Valley, and occurs between Berkeley and West Berkeley;

easily distinguished from the rigidly upright purple-stemmed rose-purple-flowered *T. tridentatum* form of those districts by its weak half reclining habit, green herbage and dull flesh-colored or whitish flowers. Occasionally the peduncles show some of that muriculation which more distinctly marks the rare *T. scabrellum*. This last I still know only from the subsaline flats of Tulare County.

TRIFOLIUM SEGETUM. Annual, glabrous, tall and stout, the hollow stems often $\frac{1}{4}$ inch in diameter and 2 feet high: lowest leaves oblong-cuneiform, retuse, 5 or 6 lines long, the others linear-lanceolate, acute, 1 or 2 inches long, serrulate: heads oval in maturity, an inch high, the lacerate involucre somewhat lobed: calyx 10-nerved, and its upper parts much reticulated, the somewhat quadrate-ovate lobes with a short awn and occasionally a tooth or two at its base: corollas $\frac{1}{2}$ inch long, light rose-red with a purple spot.

Common in dry open grounds in middle California; usually seen at its best in fields among the ripening grain. The plant is even larger than *T. obtusiflorum* and *T. majus*, and not susceptible of being confused with either. It has nothing of the bright green somewhat resiniferous herbage, or fringed leaf-margins of *T. majus*, nor of the hairiness of *T. obtusiflorum*; and the calyx in both those species is 20-nerved, in this most strictly 10-nerved; in view of which character I had always referred it to *T. tridentatum*, to which it is truly allied.

TRIFOLIUM FENDLERI. Perennial, glabrous, low, matted and only a few inches high, or taller and decumbent: leaflets of the lowest leaves smaller and obcordate, or obovate and emarginate, the middle cauline $\frac{1}{2}$ to $\frac{3}{4}$ inch long, obovate-oblong, very obtuse, the uppermost usually oblanceolate, acute, all very minutely serrulate: heads slender-peduncled and large, 1 inch in diameter; involucre many-lobed and the lobes not deeply lacerate: corollas crowded in the hemispherical head, $\frac{1}{2}$ inch long, narrow, white or merely pink-

ish with rose-purple center: calyx of thin texture, the 10-nerved tube only half as long as the slenderly subulate not rigid nor pungent-pointed teeth: pod equalling the calyx-tube, turgid, distinctly stipitate, 2-seeded: seeds very small for the plant, little compressed, green, scarcely dotted.

Wet meadows and about cold springy places in the mountain parks of southern Colorado and northern New Mexico; also along irrigating ditches among the lower foothills, and on the plains, here an immigrant from its native subalpine stations. A singularly beautiful member of this most difficult group, the perennial involucrate clovers; but easily distinct from the Mexican *T. Ortegæ* (*T. involucratum*, Willd.), and from the far northwestern and maritime *T. fimbriatum;* these two being its nearest relatives.

TRIFOLIUM KINGII, Wats. This, in so far as the herbaria show, is an exceedingly rare species. The one so commonly seen in collections under this name is the very different *T. productum*, Greene. The original of Mr. Watson's *T. Kingii* was obtained away upon the very easternmost limit of the geographical range of the species, in the Wahsatch Mountains, Utah. Its home is in the meadows of the upper Humboldt, in Nevada. Here I have collected it more than once; and my specimens are of three or four times the size of those of Mr. Watson. These specimens, like the originals, are not to be distinguished from *T. Beckwithii* except by their somewhat more elongated heads, and more strongly deflexed fruiting pedicels. In characters of foliage and of calyx the two species are quite alike. I possess an abnormal specimen of *T. Kingii* from Deeth, Nevada, in which most of the leaves are of five large subequal leaflets.

TRIFOLIUM RYDBERGII. Subspecies of *T. longipes*, but plant twice as large, apparently not forming a turf, but the stoutish stems erect, a foot high or more, the stout peduncles shorter in proportion: leaflets of lowest leaves oval, the others oblong, elliptic and narrowly lanceolate, often nearly

2 inches long, minutely serrulate: heads an inch in diameter, 1½ inches high, ovoid in flower, semiovoid in fruit by the deflection of all the pedicels: calyx villous, the tube only half as long as the slender-subulate teeth.

Wind River Mountains, Wyoming, collected by Nelson, and in the Spanish Basin, Madison Range, Montana, Flodman. Mr. Nelson's fine specimens were distributed partly as *T. eriocephalum*, and partly as *T. longipes*.

TRIFOLIUM ELMERI. *T. plumosum*, Elmer Drew, in Bull. Torr. Club, xvi. 149, not of Dougl. Perennial, glabrous, the several stems upright, 2 feet high including the long naked peduncles (but these 6 or 8 inches long): elliptic-lanceolate abruptly acute and saliently dentate leaflets 1½ to 2 inches long or even longer: heads rather more than an inch broad, subglobose, the pedicels not deflexed in age: calyx-tube short, villous, the almost filiform teeth four times longer, subplumose below, naked above.

Banks of the South Fork of Trinity River, near Grouse Creek, in northwestern California, collected by Messrs. Chesnut and Drew in 1889. Not otherwise known, unless a single specimen collected long ago by Douglas, and preserved in the herbarium of the British Museum without a name, be of this species.

TRIFOLIUM LATIFOLIUM. *T. longipes*, var. *latifolium*, Hook. Lond. Journ. Bot. vi. 209. This plant, now abundantly represented in the herbaria, shows no traces of intergradation with *T. longipes*, from which its low stature, not at all elongated peduncles, its broad short leaflets, and distinctly pedicellate flowers all deflexed in age, thoroughly and specifically distinguish it.

TRIFOLIUM MACILENTUM. Perennial, slender, glabrous, a foot high, the leaves mostly radical and the peduncle terminal: leaflets very thin and membranaceous, only sparingly

venulose, those of the long-peduncled radical leaves about an inch long, oval or obovoid, some angularly lobed, truncate or retuse, unevenly dentate, the cauline lanceolate or oblong-lanceolate, 1½ inches long, more saliently toothed, some of the teeth retrorse: stipules very small, only 2 or 3 lines long, entire: heads large, the corollas ½ inch long, soon deflexed: calyx pubescent, with short tube and not much longer setaceous teeth.

Known only from specimens collected somewhere in southern Utah, by Dr. Palmer, in 1877. In characters of leaf and flower much like *T. Howellii*, but in habit more like *T. Kingii*, but that has ample stipules, very veiny leaflets, and a very firm and substantial texture of foliage, while *T. macilentum* is marked by an altogether characteristic thinness of leaf, in which particular *T. Howellii*, but no other native typical *Trifolium*, makes an approach to it.

ASTRAGALUS PAUPERCULUS. Annual, erect, slender, only 2 to 6 inches high, sparingly branched; cinereous with short appressed hairs, except the glabrous upper face of the leaves and the blackish-hairy calyx: leaflets in 4 or 5 remote pairs, oblong, truncate, scarcely 2 lines long: peduncles filiform, surpassing the leaves, somewhat capitately 2 to 4-flowered: calyx campanulate, the subulate teeth only half as long as the tube: corolla purple, the banner 2 lines long or more; ample and conspicuously surpassing the other petals: pods ½ to ¾ inch long, falcate, somewhat flattened, the cross-section narrowly obcordate.

A diminutive species, first collected by myself now more than twenty years since, on a dry hillside of the upper Sacramento, but in flower only; and I could never determine whether it would be of the short-podded group to which *A. didymocarpus* belongs, or an ally of *A. tener*. Fruiting specimens sent in recently from the same district indicate its close relationship to the latter, and to *A. Rattani*.

CASSIA CONFINIS. Suffrutescent, 2 or 3 feet high, canescently villous-tomentose throughout: stipules setaceous: leaflets in 2 unequal pairs, the upper much larger than the lower, all obliquely round-obovate, those of the upper pair more than an inch long, the younger ones all tipped with a setaceous mucro, but this deciduous, the mature leaflet being obtuse or retuse and pointless; flowers few, umbellately terminating stout ascending peduncles: pods oblong, 1 inch long, subterete, somewhat hirsute, beaked by a stout subulate style.

Los Angeles Bay, Lower California, Dr. Edw. Palmer, 1887. Related to *C. Covesii*, but with very different leaves and pods.

STREPTANTHUS LINEARIS. Annual, erect, simple, 2 feet high, glabrous, glaucous: basal leaves unknown, the cauline about 3 inches long, very narrowly linear, entire, sessile; the very lowest floral (or those of the 2 or 3 short branchlets of the otherwise simple raceme) similar except a short subsagittate dilated basal part; the few proper floral bracts cordate-ovate, and from caudately acuminate to merely acute: raceme short for the size of the plant and few-flowered: flowers nearly $\frac{1}{2}$ inch long, white; calyx ovate-oblong, subsaccate: petals with broad claw and also a well developed and rounded limb: stamens in 3 unequal pairs, but all with well developed polliniferous subsagittate anthers: fruit unknown.

Mariposa Co., Calif., April, 1895, Mr. J. W. Congdon; the specimens distributed under the name of *S. diversifolius*, to which the species is indeed related, but from which it differs notably in the thrice larger and differently constructed flowers, the curiously caudate-acuminate bracts, and the less narrowly linear perfectly entire foliage.

STREPTANTHUS ASPER. Annual, stoutish, simple, or branched from near the base, 1 to 2 feet high, the leaves and lower part of the stem hispid: leaves spatulate-linear,

coarsely toothed, 3 inches long, the rameal ones shorter, dilated below and sagittate-clasping: racemes elongated, the whitish flowers on very short pedicels: sepals subequal, obtuse, none saccate at base, all carinately 1-nerved, glabrous: petals all with broad claw and rather narrow limb, very unequal, the upper pair much longer: upper pair of filaments exserted, united almost throughout and with small abortive sterile anthers, the other stamens very short, scarcely exserted: pods 2 inches long, ascending or suberect, rather broadly linear, carinate-nerved: seeds suborbicular, narrowly winged.

Mt. St. Helena, Calif., June, 1894. Collected only by the author.

STREPTANTHUS FOLIOSUS. Annual (?), tall and branching, glabrous and glaucous: lower leaves and main stem unknown, the mere flowering branches 1 to 1½ feet long, very copiously leafy or leafy-bracted, the leaves or bracts from oblong-obovate to orbicular, the lower and elongated ones saliently dentate, the upper and rounded entire, mucronate, these producing from their axils similarly round-bracted branchlets each terminating in short sessile dense speciform raceme of large white flowers: sepals thin, subequal, two slightly saccate, the tips of all rather amphiate and recurved: petals narrow and inconspicuous: stamens all with exserted linear stigmas, and their filaments distinct.

The fragmentary though large specimens indicating a strongly marked species of the *S. tortuosus* group have been in my herbarium some eight or nine years. I had hoped to obtain fruiting specimens, as well as some data regarding the root and lower leaves before publishing; but the remote and scarcely explored parts of the Californian mountains (of Fresno County) whence the fragments were brought to me are still unvisited by any botanist. The short sessile spikes at the ends of branchlets, upon which the round cordate-clasping bracts are quite crowded, are in striking contrast with the inflorescence of every other known *Streptanthus*.

STREPTANTHUS ARGUTUS. Perennial, stout, erect, 1 to 1½ feet high, rather succulent, glabrous, glaucous: tufted radical leaves 2 inches long, spatulate, very obtuse, saliently and sharply dentate, the teeth in some verging towards the serrate, occasionally runcinate, the cauline few and mostly in the form of oblong-ovate cordate-clasping bracts an inch long or more and entire or the rounded apex toothed: flowers not well known, but white, the sepals not bristle-tipped: pods in a loose raceme, ascending or suberect, 2 or 3 inches long, 1½ lines wide, merely mucronate by the subsessile stigma: seeds suborbicular, winged.

Native of mountain parks in middle and southern Colorado, where it has been collected and distributed rather extensively by H. N. Patterson as *S. cordatus*, and more recently by Miss Eastwood, under the same name.

STREPTANTHUS CRASSIFOLIUS. Perennial, but taller and more slender than the last, glabrous, glaucous: lowest leaves tufted, 2 or 3 inches long including the obovate serrate or dentate blade and narrowly winged petiole, the few cauline sessile, lanceolate-cordate, entire, 1 or 2 inches long: raceme long and loose, the large oblong-ovoid calyx purple, the sepals with a tuft of short bristles at tip; narrow limb of petals dark purple; anthers of the longer pair of stamens partly exserted, the others included: ascending pods 2 or 3 inches long, only a line wide, slightly torulose, somewhat rostrate-acuminate: seeds oval, winged, but the wing broad around the summit of the seed, and narrowed toward the funiculus.

Frequent in the mountain districts of eastern California southward, and in adjacent Nevada and Arizona. The great bulk of all that is in the herbaria as "*S. cordatus*" is this species; for it has an extended range, and has often been collected.

STREPTANTHUS CORDATUS, Nutt. T. & G. Fl. i. 77. Of this species no type specimen is known to be extant; and only

somewhat recently have any plants been collected from anywhere near the probably original station which answer to Nuttall's description of *S. cordatus*. These are from Wyoming and eastern Utah, and are so very unlike the plants described above that it has seemed needful to indicate the two new species, in comparison with either of which the Wyoming plant, still very rare in collections, has the thinnish leaf-texture characteristic of all the more typical *Streptanthi*, as also a short and dense raceme or spike of pale flowers, the very short stamens which Nuttall attributes to his type, sepals not bristly at tip, and the pods relatively narrow and deflexed or recurved.

The specimen in my herbarium, which I confidently take for the only real *S. cordatus* which I possess, is from near Evanston, Wyoming. Two others quite like it are in the U. S. herbarium from eastern Utah. And it must have been in about this same region, a little further north perhaps, but in Wyoming, that Nuttall obtained this plant, and several other of his new species in other genera, which have not yet been found elsewhere, and which the later generation of botanical travelers have been slow to rediscover.

HIERACIUM BARBIGERUM. Stems slender, barely a foot high, apparently from deep-seated roots or rootstocks, leafy only toward the base, the subcorymbose inflorescence terminating a scapiform peduncle: leaves somewhat crowded, not rosulate, but erect or ascending, lanceolate, short-petiolate, acute, entire, 3 or 4 inches long: petioles and leaf-margins notably hirsute with long spreading hairs which extend more sparsely to both faces of the leaf, and still more sparsely to even the stem and peduncles, the lower faces of the leaves also minutely tomentulose with branched hairs: heads only 3 to 5, long-peduncled, 4 or 5 lines high; involucre strongly hirsute in the manner of the foliage, with also a few dark setulose hairs and some of the minute tomentulose hairs: flowers yellow: achenes not known.

From Modoc or Lassen Co., California, and from Ashland Butte, Oregon. Mr. Howell, who collected the specimens last referred to, distributed them as *H. cynoglossoides*, var. *nudicaule*; but they show specific characters. The underground growth is evidently quite peculiar.

APOCYNUM MEDIUM. Erect, 2 to 4 feet high, branching above: leaves ascending, ovate-oblong or elliptical, acute, mucronulate, pale and sparingly pubescent beneath: the rather numerous branches flowering almost simultaneously, the flowers in double or treble loose short-peduncled cymes and nodding: calyx-segments broadly lanceolate, more than half as long as the corolla: corolla light rose-color, 2 lines long, with short-cylindric tube a little longer than the triangular-lanceolate spreading segments: pods deflexed.

Plant perhaps not uncommon in the middle eastern States; being the *A. androsæmifolium* of the District of Columbia lists, but as exactly intermediate as possible between that species and *A. cannabinum*. The essential differences between those two do not seem to me to have been at all fully stated hitherto. *A. androsæmifolium* is seldom if ever erect. Its branches are ascending; its foliage either spreading or deflexed, and all its branches flower simultaneously; its corollas are pinkish or rose-color, exactly campanulate and nodding. *A. cannabinum* is always strictly erect, with ascending—never spreading—foliage. Its branching is of the dichotomous order, the terminal cluster of flowers always developing first; those of the lateral branches superseding the first and appearing later. The corollas are green (so described even by Linnæus), never white or even tinged with pink or rose; they are strictly erect, narrow and cylindric. It should be noted further that *A. cannabinum* is invariably light green as to the color of its herbage; the other dark green, with a glaucous-pale under surface to the foliage. *A. medium* has the general hue, the pinkish flower-color, and that simultaneous flowering of all the branches which be-

long to *androsæmifolium*, but the habit, the leaf-posture and even the leaf-outline that so distinctly characterize *cannabinum*. No botanist seeing the plants when past flowering would doubt their being *A. cannabinum;* yet, as I have said, when in flower they are, in spite of all, taken as belonging to *androsæmifolium;* yet the corolla is in its pattern not that of the last named, but more nearly that of the other. The new species has a fine Pacific American homologue in the middle Californian *A. floribundum.*

APOCYNUM ALBUM. Near *A. cannabinum*, but of lower stature and much more freely branching, but the branching dichotomous: herbage very light green, wholly glabrous: leaves elliptic-lanceolate, elliptic, or oblong, acute, those of later and sterile branches small, narrow and almost crowded: cymes small and few-flowered as compared with those of *A. cannabinum:* segments of the calyx rather broadly lanceolate, nearly equalling the very small clear white campanulate erect corollas: pods slender, deflexed, one in each pair straight, the other falcate.

Common in moist land along the Potomac River, and perfectly distinct in the character of its flowers; as also of marked divergence from *A. cannabinum* in its whole aspect. The leaves are distinctly more narrow and elongated than in any form of that. I think it not impossible that this may be the species of which the *A. pubescens*, R. Br., might prove a pubescent form; but, as I have not access to Brown's diagnosis, I am unable to form a well grounded opinion.

I may add that the research which the segregation of these two proposed species has entailed has brought me to a conviction of the validity of Hooker's *A. hypericifolium.*

# On the Classification of Asclepiads.

That notable multiplication of genera which marks the recent history of the Asclepiadaceæ has proceeded as it were in violation of one of the most firmly established principles of taxonomy; the principle that plants are related in the ratio of the similarity of their fruit-structure; that plants whose fruits are essentially at one are of one genus. Now the peculiarly formed follicular pericarp, with its spindle-shaped mass of flat obovate imbricated silky-appendaged seeds, is so exactly one thing throughout all the 1600 or 1800 species of this family that it plays almost no part at all in the delimiting of the genera. Bentham and Hooker, in their elaborate key to the seven tribes and one hundred and forty-six genera of the order, do not once mention the fruit. It is essentially the same thing in all. And if the synthetic value accorded to pods and seeds in other families were admitted here, instead of nearly two hundred genera of Asclepiads we should have scarcely more than the two or three that were recognized by Tournefort and by Linnæus.

It was only within the present century that men began to see that, in the treatment of these plants, an exception must be made as to the synthetic value of similarity in fruit. Even as late as about the year 1815, everybody, even the most accomplished systematists, presented the genus *Asclepias* as including not only our types of *Acerates*, *Asclepiodora*, *Podostigma* and *Anantherix*, but also even *Vincetoxicum*, *Sarcostemma*, *Oxypetalum*, *Gonolobus*, *Enslenia* and *Hoya*, not to mention the representative species of as many other genera, as the genera of Asclepiads are now understood and accepted.

This complete dismemberment in recent times of the *Asclepias* of the celebrated eighteenth-century and early

nineteenth-century authorities—this breaking up of their one genus into a natural family—is doubtless expedient, and must continue to stand approved. But I conceive that the real principles upon which the segregation of genera has proceeded, and may still proceed further, have not been sufficiently looked into.

It is not only in respect to their fruit that *Asclepias* and the many genera that have now been segregated from it are quite alike. They have the same umbelliform inflorescence, the same calyx, the same corolla, the crown only excepted, and they are treated as if at no notable disagreement among themselves even as regards their stamens and pistils.

It is, as I have just intimated, in the corona of the perianth, with its interesting diversities in the minutiæ of its conformation, that so many characters of supposed generic value have latterly been detected. To some of these modifications of the corona a fanciful and exaggerated importance has been attached; as for example to that diminutive organ which is commonly known as the horn of the hood. It is easy to note the presence or absence of such an organ; and because it is easier than to recognize, or teach to recognize, a difference in habit, therefore even the professed systematist is under a temptation to rely upon it as an essential generic character; to magnify its importance. It was Linnæus, the most unnatural and artificial of systematists, who indicated the horn of the hood as the character of *Asclepias;* and yet, a hundred years after Linnæus, men like Bentham and Asa Gray, professedly ignoring artificialism in taxonomy, are more absolute artificialists than Linnæus himself when they come to the treatment of *Asclepias* and its allies; for they both make the horn the absolute and only mark of *Asclepias*, which Linnæus, after all, had too much of the sense of what is natural and rational in classification to carry into effect. He does indeed name the horn as a character of the genus, yet, out of his eighteen species of *Asclepias*, only eleven have it; the other seven being destitute of any trace of it. And

he did not know one of those plants of the United States now placed, some in *Acerates* and others in *Gomphocarpus* by Bentham and by Gray. It was no wonder, therefore, that all these plants, as well as the types of several other hornless-hooded genera of ours, were early referred by their discoverers to *Asclepias*.

And Elliott, who founded *Acerates*, and who lived and wrote before the revival of the Natural System, did not rely so wholly upon that negative peculiarity of the absence of the horn as the name which assigned the genus might seem to imply; for he says: "It is perhaps doubtful whether the absence of the horn-like appendages constitutes a sufficient character to establish this genus. I should have been better satisfied with it if it had separated the species of *Asclepias* with alternate, from those with opposite leaves."[2]

If Elliott had proceeded to state what he found in the habit of his *Acerates* to mark it as unlike *Asclepias*, he must needs have mentioned (1) the strictly lateral inflorescence, the umbels being ranged up and down almost the whole length of the stem, yet none being terminal; (2) the subsessile character of the umbels; (3) the small size, narrow and elongated configuration, and the green color of the individual flowers, etc. To me these several peculiarities make so strong an impression of the distinctness of the genus that I should have supported its validity if every species of it had been furnished with the "horn" of *Asclepias*. And I am at perfect agreement with Dr. Britton in his having transferred the *Asclepias stenophylla* of Asa Gray to *Acerates*. It is simply an *Acerates* with a horn to its hood; just as certain Californian plants of the *Asclepias* habit are of the genus *Asclepias* though completely destitute of the horn.

But there is one point in the floral structure of *Acerates* by which it differs constantly from *Asclepias*, and that is the outline of that curious organ called the anther-wing. This

[2] Ell. Sketch, i, 317.

throughout *Acerates* is angled and notched at about the middle, from which point it tapers both ways. In *Asclepias* it is broadest and notched at the very base, thence tapering to the summit. This character was noticed by Gray, though he did not accentuate it, préferring to treat the horn of the hood or its absence as the more important. That he was wrong in this judgment is demonstrated completely by the fact that treating the born as the more essential technicality he was obliged to ignore habit, and put into *Asclepias* a species which is, as he admitted, habitally an *Acerates*. And to the anther-wing character is necessarily accorded a higher importance because it brings together plants at perfect agreement in habit.

Coinciding with *Acerates* in point of their strictly lateral inflorescence and green flowers are two other groups of North American Asclepiads which must be separated from *Asclepias*, since they are at variance with that genus not only in habit but in floral characters of more importance than the presence or absence of the horn. One of these groups seems to be monotypical, and I name it, in allusion to its most important floral character,

## OXYPTERYX.

Plants with habit, lateral inflorescence and subsessile umbels of *Acerates*. Corolla reflexed in anthesis. Column under the hoods almost none. Hoods excessively large and conspicuous though dull-greenish, thin and conduplicate throughout though consisting of a very distinct triangular-lanceolate basally truncate or somewhat auriculate blade, and shorter narrower linear claw, the former appendaged near the middle with an abruptly falcate-incurved and acuminate crest or horn. Corneous anther-wings acutely triangular, broader than long, broadest at the angled middle portion and tapering abruptly both to apex and base, the angle without a notch.

1. Q. ARENICOLA. *Asclepias arenicola*, Nash. Bull. Torr. Club. xxiii. 252 (1896). While the plant as a whole would be taken when out of flower for nothing else but an *Acerates*, the flower itself is structurally farther removed from that genus than is even *Asclepias* itself. The hoods, as much shortened, reduced and put out of sight, as it were, in *Acerates*, are here become the conspicuous part of the flower, being elongated so as far to supersede the other organs, and dilated to resemble petals, besides being more distinctly than in any other of our Asclepiads differentiated into blade and claw. The form of the anther-wing in *Oxypteryx* is perfectly unique, being broadest and acutely angled in the middle, and quite destitute of the notch which marks invariably all the species of both *Asclepias* and *Acerates*.

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Another natural genus, and one which I have for twenty years regarded as such, has for its type the *Asclepias longicornu* of Bentham. The plants are far more nearly related to *Acerates* than to *Asclepias*, having the low stature, broad foliage and strictly lateral inflorescence of subsessile umbels of green flowers that mark *Acerates*. They have for their most important technical mark exactly the anther-wings of that genus, yet are widely separated from it, and also from *Asclepias* by other points of floral structure. As the type-species has been assigned a subgeneric name, I shall employ that name for the genus as such.

## PODOSTEMMA.

Plants stout and low, leafy and floriferous from the base, the umbelliform clusters exclusively lateral and subsessile (as in *Acerates*), but the flowers few and large (as in *Asclepiodora*). Hoods excessively elongated, far exceeding the anthers, mainly solid (as in *Anantherix*, *i. e.*, *Anthanotis*), but near the summit laminately dilated, and here bearing usually two horns, one short and included, the other long and well

exserted. Anther-wings (wholly as in *Acerates*) broadest, and notched, in the middle, thence tapering both ways.

1. P. LONGICORNU. *Asclepias longicornu*, Benth. Pl. Hartw. 24 (1840). An almost exclusively Mexican species, the only specimen seen by me from within the U. S. being one in the U. S. Museum obtained in southwestern Texas in 1891 by J. E. Bodin. All the so-called *A. longicornu* of New Mexico and Arizona is plainly referable to other species. The essential floral characters of the present species are the greatly elongated and narrow solid basal part of the hood, and the distinctly angled (semi-rhombic) anther-wing.

2. P. LINDHEIMERI. *Asclepias Lindheimeri*, Engelm. & Gray, Pl. Lindh. 250 (1845). *A Wrightii*, Greene, in Gray, Proc. Am. Acad. xvi, 102 (1880). Frequent in western Texas and southern New Mexico. Plant lower, stouter and more nearly glabrous than *P. longicornu*, with shorter hoods, but very definitely distinguished by its rounded (semiovate) rather than angular anther-wings. It is to be noted that Dr. Gray finally referred his *A. Lindheimeri* to *longicornu*, and my *A. Wrightii* to *nyctaginifolia*. But all the *P. Lindheimeri* and *A. Wrightii* that I have now been able to compare are at absolute agreement in all points, and quite distinct from all others as to hoods and anther-wings. These latter have here the usual notch near the middle, but their outline is nevertheless as a whole curved and not angular; and this semiovate character was indicated in the original diagnosis of *A. Wrightii*.

3. P. HELLERI. Glabrous, leafly from the base, but floriferous only near the summit: leaves thin, from deltoid-ovate to oval, only 2 or 3 inches long, on petioles of nearly an inch: flowers large as in the foregoing: hoods long, about twice the length of the anthers, their amply laminated upper part as long as the solid basal part: anther-wings thick, semi-rhombic.

Collected near Gregory, Texas, 1894, by A. A. Heller. Species most distinct from *P. longicornu*, for which Mr. Heller mistook it, not so much in floral structure as in the thin membranaceous broad foliage, and the few umbels, these being near the summit of the stem, though none are terminal. The foliage in all other species known is decidedly thick and subcoriaceous or half succulent:

4. P. NYCTAGINIFOLIUM. *Asclepias nyctaginifolia*, Gray, Proc. Am. Acad. xii. 69 (1876). Common species of western and southern Arizona and adjacent southeastern California; easily distinguished from all other species by its stout thick not at all elongated hoods, their solid part not narrowed, but covering the column. In structure of hood this is near the genus *Otaria;* but in *Otaria* the habit and inflorescence are precisely those of *Asclepias*, and the character of the anther-wing is also just that of all *Asclepias;* but this organ in *P. nyctaginifolium* is, as in *P. Lindheimeri*, semiovate, though with this difference, that the notch is here decidedly below the middle.

The succeeding species, all new, are as a group quite alike in having flowers of at most only half the size of those of all the foregoing.

5. P. EMORYI. Herbage cinereously subtomentose: leaves elongated lanceolate, short-petioled: umbels rather many-flowered: solid stalk of hood elongated, twice as long as the stamens and also thick, but narrowed under the broad and ample but short laminal portion: anther-wings very narrow, but not indistinctly angled.

Known to me only in a single specimen, collected on the Mexican Boundary Survey, and preserved in the U. S. Herbarium, mounted upon the same sheet with one of *P. nyctaginifolium* and the whole labelled "*Asclepias longicornu.*"

6. P. LEONINUM. Decumbent stems several from the root, more than a foot high and rather slender for the genus:

herbage pale and glaucescent or subcinereous, but only sparsely short-pubescent: leaves elongated, lanceolate, 4 to 6 inches long, on short and slender petioles: all the nodes floriferous, even the lowest: umbels few-flowered and the flowers very small: hoods stout, thick, solid almost throughout, the lamellar upper part short but rather ample: anther-wings narrow, not very notably angular: follicles long, lanceolate, acuminate.

A Mexican species, obtained in the State of Nuevo Leon by Mr. Pringle in 1889, and since then by others; all distributed, most carelessly, as *Asclepias longicornu.*

7. P. AUSTRALE. Flowers few in the umbels, larger than in the last: solid part of hood thick, lamellated upper portion broad and short: anther-wings quite broad, and broadest decidedly below the middle.

Collected by C. Wright, on the U. S. Exploring Expedition, in Nicaragua.

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## The Genus Chamæcrista.

In the early years of my herborizing in these Eastern States, no summer-blooming herbs had so strong a fascination for me as our annual sensitive-leaved Cassias; and after very many years of travel and residence afar beyond their habitat, I but lately renewed acquaintance with them.

In the far West and Southwest I had, in the long interval, grown familiar with other Cassias of different habit, different foliage, and different flowers, insomuch that on first beholding again a luxuriant growth of what is called *C. chamæcrista* in full flower, I found its floral structure not only obviously very unlike that of typical *Cassia* species, but even very perplexing. In order that each one of my readers, even those not conversant with the plan of the flower in leguminous plants, may see how I could be perplexed in this instance, I must

state that in all normal and typical Cæsalpineous Leguminosæ the flower, though almost regular and rosaceous, so to speak, as to its corolla, is nevertheless just like the papilionaceous flower in its plan. There is in the corolla of both one odd petal which is uppermost and may in either family be called the banner or vexillum. Next below the banner comes a pair of petals called the wings; then a lowermost pair denominated the keel. In shorter phrase, the ordinary cæsalpineous corolla, though quite regular, is, like the papilionaceous corolla, made up of banner, wing and keel petals; the banner being always an odd petal and uppermost in position. Now the puzzling circumstance in the case of my *Chamæcrista* corollas, as newly observed after having become familiar with those of real Cassias, lay in the obvious fact that, in the place of one lone petal at the top of the flower where the banner should be, there was a pair of petals. Then at the base of the flower, where a closely matched pair should be, in place of the papilionaceous keel-petals, there was seen to be a solitary petal larger than any of the others. At this point I seemed at first to have solved all difficulty by assuming that in this species the flower is inverted, turned up side down by a probable twist in its pedicel. Such inversion of corollas is not rare in the plant world; though it never occurs in the same genus with plants having flowers in normal posture. It is the mark more often of an entire family or natural order than even of a genus. The Violaceæ, the Lobeliaceæ and the Orchidaceæ are familiar examples of large families, one of the essential characters of each of which is an inverted corolla. Logically, therefore, this new discovery would separate the Chamæcrista group, if not altogether from the family of the Cæsalpineæ, at least from *Cassia*, to form a distinct genus. Yet hitherto, as another day's observation proved, I was in error; and my perplexity deepened as I was driven from my assumed theory that the *Chamæcrista* corolla is inverted. That larger odd petal at the bottom of the flower

proved to be by no means the banner, but one of the wing-petals, its mate being one of those two small ones at the top of the flower. The real banner-petal, perfectly demonstrated as such by its position in the bud as enfolded by the wings, is the large concave lateral petal at the left-hand side of the flower. In the accompanying illustration figure 1 represents very accurately the corolla of *Cassia Marylandica*, *b* indicating the banner-petal, *w w* the wings, *k k* the keel. Figure 2 as perfectly displays the same organ in what is called in our books *Cassia Chamæcrista*, the same letters indicating the petals by name. It will thus be seen that what marks

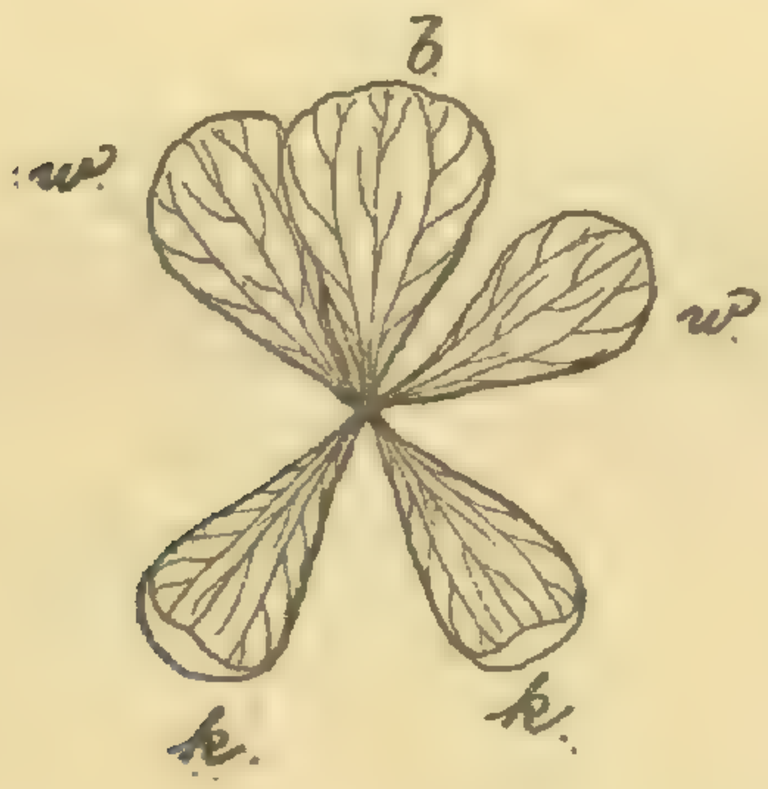


FIG. 1.

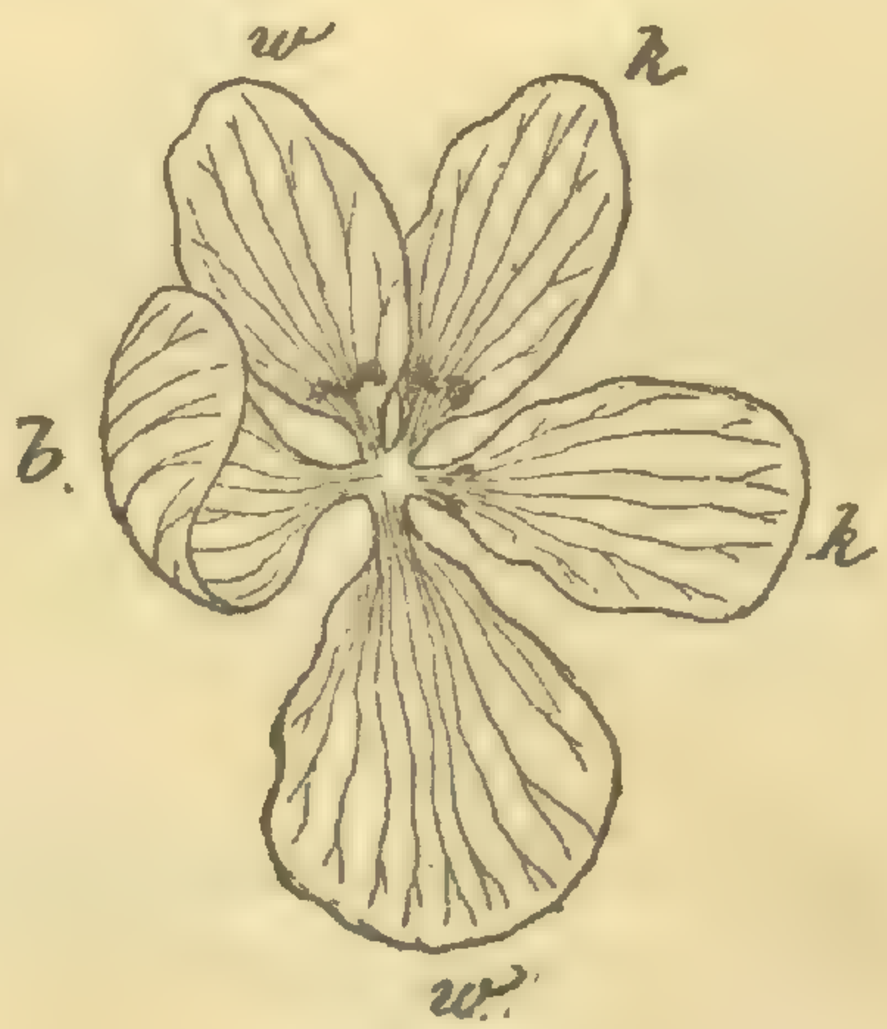


FIG. 2.

so strangely the *Chamæcrista* corolla is not an inversion, but something still more interesting and curious, namely, a torsion of ninety degrees to left—a character which, by itself alone, if considered in connection with the peculiar habit of the plant and its rather numerous allies, would establish the whole group as securely in the rank of a distinct genus as any genus could need to be established. I shall, however, here enumerate the actual characters of the genus CHAMÆCRISTA as I have recently observed them in living plants, and in dried specimens of many species. (1.) Flowers axillary or supra-axillary and solitary or few and fascicled, never terminally clustered as in *Cassia*. (2.) Buds

slender-conical and acuminate (always subglobose or ovoid and obtuse in *Cassia*.) (3.) Sepals plane, slenderly acuminate, thin-membranous (in *Cassia* firm-herbaceous, obtuse, concavo-convex). (4.) Flower on a twisted pedicel, its banner and keel petals thus made to appear lateral, and one wing enlarged and placed lowermost, the other reduced and becoming uppermost. (5.) Pods thin, compressed, very promptly dehiscent, never subterete and indehiscent as in most or all Cassias.

The genus was founded by Johann Commelin just two centuries ago (1697), on a West Indian plant, this same being the type of *Cassia Chamæcrista*, Linn. Linnæus suppressed the genus. Mœnch restored it in 1694, and seems to have insisted on the large size of the lower petal (the left-hand wing petal) as the most essential character; so that he certainly observed the structure of the corolla to be widely at variance with that of *Cassia*. In the course of the present century a number of authors seem to have maintained it; but in so far as I have been able to read the history, the real, and superlatively numerous, characters of the genus are here for the first time clearly indicated.

I do not attempt to transfer to CHAMÆCRISTA any more than a small proportion of the species which belong to it.

* *Large-flowered species, all the petals spreading, only moderately unequal.*—CHAMÆCRISTA proper.

1. C. PAVONIS, Cass. Dict. viii, 78 (1817). *Cassia Chamæcrista*, Linn., not of recent American authors. *Chamæcrista pavonis major*, Commelin, Hort. Amst. i. 53, t. 37 (1697). Plant indigenous to the West Indies and perhaps northern South America; the type of the species, according to all the figures cited by Linnæus, having solitary supra-axillary flowers. The Virginian plant referred here by Linnæus is in all probability the next species. Though possibly either *Cassia robusta*, Pollard, or his *C. Mississippiensi*, or *C. Simpsonii* may prove identical with typical Linnæan *C. Chamæ-*

*crista*, and more or less recently introduced from Jamaica or Barbados, from the islands to which Linnæus credits his type.

2. C. FASCICULARIS. *Cassia fascicularis*, Michx. Fl. i. 262 (1803). *C. Chamæcrista* of American authors, scarcely of Linnæus. The very considerable fascicle of flowers, as well as the other characters assigned this species by the extremely critical and careful author of the Michaux Flora preclude my accepting the doctrine that this plant can be identical with the first species of this series. Mr. Pollard trusts that Mr. Bentham was correct in suppressing it; but all who know Mr. Bentham's views and methods will doubtless agree with me that he would have been likely to have reduced to Linnæus' *C. Chamæcrista* every one of those large-flowered species which Mr. Pollard has proposed as new. *C. fascicularis* I suppose includes all the northern plant with the large corollas; and my own opinion is that all Mr. Pollard's new species are perfectly distinct from this; though, as I said above, I suspect that some one of them may be the true *Chamæcrista pavonis*.

3. C. DEPRESSA. *Cassia depressa*, Pollard, Bull. Torr. Club. xxii. 515, t. 251 (1895). This Floridan species bears solitary flowers, and is thus allied to *C. pavonis*; but its habit is so entirely peculiar that I can not doubt its perfect validity as distinct from the old original type of *Chamæcrista*, whatever that may ultimately prove to be.

4. C. FLAVICOMA. *Cassia flavicoma*, HBK. Nov. Gen. vi. 366 (1823). A most beautiful South American representative of the genus; apparently a large plant, and shrubby.

5. C. TRISTICULA. *Cassia tristicula*, HBK. l. c. 367. Near the last, and of similar geographical range.

6. C. PALMERI. *Cassia Palmeri*, Wats. Proc. Am. Acad. xxii. 408 (1887). A neat representative of the low suffrutes-

cent type of *Chamæcrista*, not rare in middle and northern sections of Mexico; the flowers as large as in the larger species.

** *Small-flowered species; one of the petals much larger than the others and spreading, the other four minute, erect, forming a cup.*—Genus NICTITELLA, Raf.

7. C. NICTITANS, Mœnch, Meth. 272 (1794), excluding the synonym *C. chamæcrista*, Linn. *Cassia nictitans*. Linn. Sp. 380 (1753). Of the northern U. S., with about the same general range as *C. fasciculatis*.

8. C. ASPERA. *Cassia aspera*, Muhl. in Ell. Lk. i. 474 (1821). Thoroughly distinct from *C. nictitans*, as Elliott demonstrated, and as Mr. Pollard has reasserted. Peculiar to the southern U. S.

9. C. MULTIPINNATA. *Cassia multipinnata*, Pollard. Bull. Torr. Club. xxii. 515, t. 250 (1895). A Floridan species; and Mr. Pollard's variety *Nashii* looks as if it might well be specifically different; but I have not seen the living plant.

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## STUDIES IN THE COMPOSITÆ.—VI.

In finishing the manuscript for part IV of the *Flora Franciscana*, I found it necessary to propose a few new genera, and to restore certain others which had been ignored by American botanists of the last generation. These all require discussion beyond what the limits of a local Flora seemed to admit of; and first among such is *Leucosyris*, only a single species of which occurs within the territory covered by the volume referred to. The plants which I should refer to it are the following:

1. L. CARNOSA, Greene, Fl. Fr. 384. The synonymy given at length in the place cited need not here be repeated.

2. L. SPINOSA. *Aster? spinosus*, Benth. Pl. Hartw. 20 (1839); Gray, in T. & G. Fl. ii. 165 (1841). *Aster spinosus*, Gray, Pl. Lindh. ii. 219 (1850), and Syn. Fl. 203. Notwithstanding the great elasticity of the genus *Aster* as maintained by Bentham and by Asa Gray, both these authors early held this plant to be only a very dubious *Aster*. But it was never, like the type-species of *Leucosyris*, shifted about from genus to genus on trial. The two species go well together, being at agreement in having pale green reedy almost leafless stems, and permanently white corollas, the rays being either very short or wanting.

The typical *L. spinosa* is Mexican and Central American, and is described as shrubby or at least suffrutescent; and the same character is attributed by Lindheimer to the Texan plant. This leads me to doubt if the plant of the lower Colorado and Gila rivers be not a distinct species. I have seen many acres of this, both in Arizona and California, and am certain that there it is at least ordinarily a herbaceous perennial, the numerous annual stems arising from horizontal roots or rootstocks, and when young are clothed with long linear flaccid leaves; these mostly disappearing before the flowering season; and some specimens pass to the flowering and fruiting without developing any spines. It is, in fact, never the manifestly shrubby and forbiddingly spiny bush which comes to us from towards Central America under the name of *Aster spinosus*.

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To the genus *Leucelene*, proposed at page 147 preceding, I tentatively referred Nuttall's *Chrysopsis alpina* when finishing the manuscript of the Compositæ for the *Flora Franciscana;* but such a disposal of that interesting plant of the northern Rocky Mountains does not satisfy. *Leucelene*, as based on the small branching herbs of the Rocky Mountain plains and hillsides, will doubtless be shown a genus of several species at one in habit as well as character; mean-

while, what I named *L. alpina* belongs more naturally to another group as Asteroideæ, that of which *Aster linariifolius* may be taken of the type. Receiving this group in generic rank, I propose to name it, in allusion to the violet rays,

## IONACTIS.

Low tufted perennials, often lignescent at base, never stoloniferous, or with radical leaves. Stems clothed equably with narrow entire rigid one-nerved and veinless leaves and terminating in one or more showy heads with violet rays. Involucre of well imbricated bracts of coriaceous texture, without herbaceous tips, appressed even to the tips. Achenes narrow, villous. Pappus double, the more copious inner series bristly, the outer short and setulose.

1. I. LINARIIFOLIA. *Aster linariifolius*, Linn. Sp. 874 (1753). *Chrysopsis linariifolia*, Nutt. Gen. ii. 152 (1818). *Diplostephium linariifolium*, Nees, Ast. 199 (1832). *Diplopappus linariifolius*, Hook. Fl. ii. 21 (1834). One of the most beautiful of all North American asteraceous plants, and of the widest geographical range, being of frequent occurrence from Newfoundland to Wisconsin and Texas. All foreign authors, even the most careful and critical, seem to have believed it suffrutescent, having been misled by the hardness and rigidity of the stems in the herbarium specimens. Although as good a botanist as Lindley insisted on *A. rigidus*, Linn., as distinct from this, I can find no ground for that opinion.

2. I. ALPINA. *Chrysopsis alpina*, Nutt. Journ. Philad. Acad. vii. 34. t. 3, fig. 2 (1834). *Diplopappus alpinus*, Nutt. Trans. Am. Phil. Soc. vii. 304 (1840). *Aster scopulorum*, Gray, Proc. Am. Acad. xvi. 98 (1880). Rather notably unlike the preceding in mode of growth, the monocephalous stems arising from a thoroughly ligneous and multicipitous base. The rays are not "light-violet" as said by Gray in

the *Synoptical Flora*. They are of a deep rich violet, much darker than those of *I. linariifolia*.

3. I. STENOMERES. *Aster stenomeres*, Gray, Proc. Am. Acad. xvii. 209 (1882). A far-western and mountain near relative of the last.

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## NEW OR NOTEWORTHY SPECIES.—XX.

DELPHINIUM SONNEI. *D. decorum*, var. *Nevadense*, Wats. Bot. Calif. i. 11. Root-cluster not at all deep-seated but very near the surface, composed of several short thick abruptly ending branches, but hardly grumose: stems one or several, a foot high or more, simple, leafy only below and racemose for about half their length: leaves rather fleshy, cut into oblong and oblong-linear callous-mucronate segments: whole herbage very green and glabrous; the sepals sparsely pubescent, the ovaries more notably so: raceme rather lax but narrow: flowers wholly deep blue, middle-sized, the nearly straight spur as long as the breadth of the expanded flower and nearly horizontal: pubescent follicles slightly divergent above: somewhat obpyramidal seeds very small, winged around the quadrate summit, but not on the angles.

A common plant of northeastern California and adjacent mountainous parts of western Nevada; collected by myself near Donner Lake, and also far northward in Siskiyou county; also by Mrs. Austin at intermediate stations in Plumas and Lassen counties, and this year in abundance by Mr. Sonne above and below Truckee. It was confused by Mr. Watson at one time with *D. Menziesii*, and at another time made a variety of *D. decorum*. Dr. Gray confused it with his own *D. Andersonii*, and again relegated it to *D. pauciflorum* of Oregon. It bears more likeness to *D. Nelsonii* of Colorado and Wyoming than to any other species, but is very distinct from that in the characters of its root and seed.

THELYPODIUM ANISOPETALUM. Annual, erect, slender, 2 to 5 feet high; stem sparingly retrorse-hispidulous below, glabrous and glaucescent above, unilaterally racemose throughout more than half its length: flowers small, on short but filiform pedicels, irregular; the sepals purple, very obtusely obovate, the two lower longer than the two upper and distinctly concave when expanded; two upper petals surpassing their correlative sepals, the two others shorter and not exserted: pods deflexed on their slender curved pedicels, very narrowly linear, acute, 2 or 3 inches long.

Valley of Mexico, 30 Sept., 1896, C. G. Pringle. Most interesting among the species of *Thelypodium* on account of the strong irregularity of its flowers, which bear a striking superficial likeness to those of some *Polygala.* Yet the specimens were distributed under the name of *Thelypodium micranthum;* though the pods alone, with their peculiar long filiform curved pedicels, furnish characters of specific value; and it may be questioned seriously whether the floral characters are not sufficient to establish the plant in the rank of a genus.

PAPAVER MACOUNII. Perennial, scapose, the very stout scapes often a foot high in fruit, three or four times surpassing the tuft of leaves, hirsute-hispid: leaves, even to the petioles, comparatively devoid of hairiness, sometimes wholly glabrous; leaf-outline ovate rather than obovate, the pinnæ oblong-lanceolate to almost linear: petals 4, roundobovate, erose-dentate, often $1\frac{1}{2}$ inches long, yellow, fading greenish: pods 1 inch long, narrow, clavate-oblong, 4–5-angled, hispid except on the prominent angles or ribs.

Abundant on the uplands of St. Paul Island, Behring Sea, J. M. Macoun, June, July, 1897. Easily distinct from all other boreal poppies by its narrow capsules, which are almost acute by the ascending position of the 4 or 5 rays of the stigma; thus approximating the scarcely tenable genus

*Meconopsis.* The plant is by no means a dwarf, like the other boreal and alpine yellow poppies. The expanded corollas exceed 3 inches in diameter in the larger specimens.

POTENTILLA ASHLANDICA. Stems tufted, slender, about a foot high, from short horizontal rootstocks: radical leaves 4 to 6 inches long; leaflets 5 to 9, with a few rudimentary ones interspersed, mostly cuneate-obovate and ½ to 1 inch long, coarsely lacerate-toothed: flowers large, in a rather close corymbose cyme: segments of the calyx ovate, acuminate, 4 or 5 lines long, conspicuously ciliate; bractlets linear-lanceolate, 3 or 4 lines long: petals bright yellow, round-obovate, nearly ½ inch long.

In wet meadows near Ashland Butte, Oregon, T. Howell.

ASTER BOLTONIÆ. Perennial, sometimes suffrutescent at base, 2 to 4 feet high, pale, glaucescent, the stem striate, loosely and somewhat corymbosely paniculate at summit: leaves linear or spatulate-linear, 2 to 4 inches long, obtuse, entire, somewhat dilated at the base and sessile, glabrous except the sparsely serrulate-ciliate margins: bracts of the hemispherical involucre nearly equal, biserial, the outer ones oblong-linear and wholly herbaceous, the inner scarious-edged below the middle and spatulate-linear; rays rather numerous, pale purple or flesh-color: achenes narrow, slightly compressed, apparently nerveless (but too young), strigose-pubescent: corolla tubular-funnelform, the teeth short and erect: style-tips broadly subulate.

In irrigated fields and along ditches in western Texas and southern New Mexico; the best specimens by Marcus Jones from El Paso, 1884. An imperfect one by E. O. Wooton from the Mesilla Valley. The plant appears to have been mistaken for *A. pauciflorus*, Nutt., to which it bears no resemblance, being much more like some *Boltonia* in aspect; but its delicate uniserial capillary-bristly pappus debars it from that genus.

HYMENOPAPPUS INTEGER. Somewhat tufted perennial, hoary with fine flaccose tomentum: leaves all radical, oblanceolate, obtusish, perfectly entire, 3 to 6 inches long including the petiole; the scapiform flowering stem with one or more entire leafy bracts: heads few, long-peduncled, low-hemispherical, nearly $\frac{1}{2}$ inch broad; bracts of the involucre oval or ovate.

Mogollon Mountains, New Mexico, H. H. Rusby, 1881.

SENECIO NEWCOMBEI. Slender and weak simple-stemmed and monocephalous perennial, with thin membranaceous foliage: leaves few and remote, long-petioled reniform-palmate, *i. e.*, of reniform outline, but distinctly and evenly 7-lobed, the lobes not deep, from broadly triangular to broadly oval, mucronulate, the whole hardly an inch wide, all the lower on elongated petioles dilated and clasping at base; the uppermost cuneate or spatulate and sessile; the whole plant with a little loose and probably deciduous lanate pubescence: involucre short and broad, almost campanulate; bracts broad, thin, almost biserial; calyculate bracts none: rays 10 or 12, $\frac{1}{2}$ to $\frac{3}{4}$ inch long; ovaries glabrous; pappus rather coarse, almost barbellulate.

Plants discovered on one of the Queen Charlotte Islands, British Columbia, in June of this year, by Dr. Charles F. Newcombe; the specimens communicated by Mr. J. M. Macoun. A rather unsatisfactory member of the genus *Senecio*, far more resembling superficially a debilitated and monocephalous *Chrysanthemum segetum*. In its pappus, as well as broad involucre, it seems to approach *Arnica*. But it must be either a *Senecio* or else *sui generis*.

VACCINIUM CÆSIUM. Evergreen shrub 2 or 3 feet high with rather small ovate or oval obtuse or acutish coriaceous leaves, these pale and glaucescent above, beneath quite white with a dense bloom, puberulent on both faces: flowers solitary, axillary, on the growing branches of the season; calyx

only angular-lobed, the lobes scarcely acute: corolla very short, open-campanulate, the very broad lobes shallow and obtuse: stamens long-exserted and conspicuous: berries large, globose, apparently dark blue, very glaucous.

A Floridan species, collected by Mr. Nash in 1894, and distributed as *V. stamineum*.

VACCINIUM REVOLUTUM. Shrub low and depressed, the short very leafy branches spreading horizontally: leaves very glaucous as in the last, but more pubescent, more oval and obtuse, their margins revolute: flowers solitary and axillary as in the last: lobes of calyx deeper, acute or acuminate: corolla also with deep but rounded lobes: stamens very short for the *V. stamineum* group, only by about half their length longer than the corolla: fruit unknown.

Of the same region with the preceding, and by the same collector; the two said to be of different habitat as to soil, humidity, etc.

VACCINIUM OBLONGUM. A compact and symmetrical deciduous shrub branched from the base and 3 to 5 feet high, the branchlets and foliage hirtellous-pubescent: leaves thin, narrowly oblong, obtuse: flowers copious and showy, solitary in all the axils, on pedicels rather exceeding the leaves, these not full-grown at flowering time: lobes of the campanulate calyx deep, triangular, rather obtuse and their tips pubescent: open-campanulate corolla white, cleft to the middle into very obtuse lobes: stamens about twice the length of the corolla.

Common on open hills along the lower Cumberland River in western Tennessee, near Dover, etc., the type specimen, and the only one seen, collected by author in May, 1863.

The three species here defined are all related to *V. stamineum*, and, though very different one from another, are all alike in respect to the manner of flowering from the axils of all the leaves. In true *V. stamineum* and its more immediate

allies only certain shortened and merely leafy-bracted twigs bear flowers, the larger branches with true leaves overshadowing these, and bearing no flowers at all.

PRIMULA EXIMIA. Rootstock simple; scape 6 to 16 inches high, twice or thrice exceeding the foliage: spatulate-oblong or oblanceolate leaves thin, glabrous, entire or obscurely crenate or dentate: upper portion of the scape, and more particularly the pedicels, densely white-farinose: umbel few-flowered and somewhat one-sided, the flowers inclining one way: calyx cleft to the middle or a little more, the segments oblong-linear, scarcely acute: corolla very large. rich dark purple, its segments entire or somewhat erose, not emarginate.

St. Paul Island, Behring Sea, Mr. Macoun, 1896 and 1897; also by several early collectors, and usually referred to *P. nivalis*, for what reasons it would not be easy to say.

PRIMULA MACOUNII. Stouter than the last, the rootstock branched and the scapes and leaf-clusters thus tufted, forming a mass: leaves obovate to oblanceolate, entire, glabrous, the inflorescence slightly glandular but without trace of farinose indument: umbels many-flowered and perfectly equilateral: calyx cleft well below the middle, its broad segments oval, or if narrower somewhat spatulate-oblong: corolla much as in the preceding, but of a lighter purple.

Abundant on St. George's Island, and doubtless elsewhere on shores of Behring Sea; my specimens obtained by Mr. Macoun in 1897. It is more nearly related to *P. Parryi* than to *P. nivalis*, an inland Asiatic species to which, by guess, it has been referred.

PRIMULA MUCRONATA. Near *P. Parryi*, rather smaller, more copiously leafy, all the leaves narrower, entire, obtuse, tipped by a very abrupt soft herbaceous mucro $\frac{1}{2}$ to 1 line long; calyx more deeply cleft, the segments relatively narrower.

Near the highest summits of the Ruby Mountains in

eastern Nevada, July, 1896; perhaps including all the so-called *P. Parryi* of Nevadan alpine heights; but differing essentially from that species, as all my specimens show, by the foliage, and in a number of significant points: (1) leaves more than twice as numerous; (2) narrower and with less distinction of blade and petiole; (3) the obtuse and long-mucronate apex; (4) the small outermost leaves of the cluster being narrowest, the width of leaf increasing toward the center of the plant. Exactly the reverse of this is true in the related species, where the short outer leaves are relatively broadest and with distinct blade and petiole, the innermost being invariably narrowest in proportion to their length.

The plant of Mt. San Francisco in northern Arizona must be referred here rather than to *P. Parryi;* its whole character being at agreement with *P. mucronata* except that it lacks the mucronation. I therefore name it var. ARIZONICA of the present species.

The Nevadan type is most unlike *P. Parryi* in its choice of a home, for it grows far above timber line, among rocks and near snow, in the coldest, bleakest places, while its Colorado relative is of sheltered subalpine wet meadows amid the forests.

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## STUDIES IN THE CRUCIFERÆ.—II.

### NESODRABA.

Stoutish acaulescent monopodial perennials, with thick perpendicular rootstock crowned by a tuft of rather ample leaves; the axils of the outer series producing leafy and racemose decumbent peduncles. Flowers yellow. Sepals equal. Pods broad, flattened, somewhat turgid, either rounded or elongated. Seeds in two rather widely separated rows under each valve, obovate, wingless. Partition of pods thin and almost filmy.—Plants of Northwest American coast islands,

in character of flower and fruit not very unlike some species of *Draba*, in aspect more like *Cochlearia*, but in vegetative characters distinct from both. The quite fresh and green herbage is nearly glabrous to the unaided eye, but a lens discloses a short and sparse pubescence of hairs partly simple and partly forked or stellate.

1. N. GRANDIS. *Draba grandis*, Langsdorff in DC. Syst. ii. 355 (1821). Peduncles about twice the length of the central tuft of leaves and 5 to 10 inches high: pods nearly 3 lines broad and from orbicular to oval, on ascending pedicels of $\frac{1}{2}$ to $\frac{3}{4}$ inch long.

The specimens in hand were collected by Mr. J. M. Macoun at Langsdorff's original station, St. Paul Island, Behring Sea, in August, 1896. The plant is said to inhabit damp rocky banks. In aspect it is much more like a *Cochlearia* than a *Draba;* and I suppose it is really the *Cochlearia spathulata* of De Candolle, Syst. ii. 369; though the character "siliqua lati lanceolata" can not be said to hold in regard to our plant.

2. N. SILIQUOSA. *Cochlearia siliquosa*, Schl. in DC. l. c. Native of the island of Unalaska; collected by Pallas. Distinguished by oblong petiolate leaves, lanceolate pods $\frac{1}{2}$ inch long and tipped with a style bearing a capitellate stigma.

Both the above remarkable plants have, by no very shrewd guessing on the part of American botanists, been referred to *Draba hyberborea*, Desv., a plant to which they bear extremely small resemblance.

3. N. MEGALOCARPA. Central tuft of leaves 3 inches high or more; leaves oblong-spatulate, obtuse, with a few coarse teeth near the summit: stout ascending peduncles 6 inches high, clothed below the raceme with oval sessile leaves $\frac{3}{4}$ inch long: pods linear-oblong, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, 2 or 3 lines wide, acutish and tipped with an acute style.

Collected 26 June, 1897, on Seal Island n. 1, Dawson Harbor, Queen Charlotte Islands, B. C., by Dr. Newcombe; and being the most southerly species, so far as known, of this peculiar group of plants. As to its pods, this is as much like some conceivable overgrown long-podded *Draba* as the first is like a *Cochlearia.*

The specimens were communicated by Mr. Macoun, and the types are in his herbarium.

---

IODANTHUS DENTATUS. *Arabis dentata*, Torr. & Gray, Fl. i. 80 (1838). The exceedingly multifarious and unsatisfactory *Arabis* of general acceptance is still without any habital group to which this plant can be referred. It stands alone, as an *Arabis;* not having even the distinctly flattened pods which the character of that genus calls for. But it is, both habitally and in its subterete siliques with some constriction between the seeds, altogether a good *Iodanthus.*

---

## NOTES ON VIOLETS.

VIOLA ROTUNDIFOLIA, Michx. Since the announcement, made by me a year ago at pages 142 and 143 of this volume, that our woodland species of blue-flowered acaulescent violets produce their apetalous flowers under ground, several of us who pursue the study of these plants with special zeal have questioned among ourselves whether *V. rotundifolia,* our yellow-flowered acaulescent species, would not prove to have underground flowers; it being also a woodland species. As this one is not only northern, but also something of a mountaineer, the data of its life history have been less accessible. However, late last August, while botanizing among the mountains of Lycoming County in northern Pennsylvania, I found myself in the midst of a luxuriant growth of the plant, and at once detected, by digging, its quite copious subterranean unisexual but seed-producing flowers; and I

was surprised to see that these are borne, not singly as in the case of the early aerial ones, but in what must probably be called a true raceme. There are from two to four of these flowers upon a common peduncle; and two or more such peduncles are produced by each plant.

VIOLA OXYCERAS. *Viola canina* var. *oxyceras*, Wats. Bot. Calif. i. 56. Small-leaved, long-peduncled, the peduncles far surpassing the leafy part of the plant; peduncles and calyx wholly glabrous, but petioles (under a lens) notably retrorse-hirtellous: flowers very large, light-blue or pale violet, the lower part of each petal darker blue and notably striate-veiny: spur greatly elongated, gradually tapering and acute.

A very distinct species of the Californian Sierra Nevada; its characters hitherto but imperfectly indicated. *V. adunca*, confined to the seaboard, has a different pubescence, and rich red-purple corollas of another pattern, and a shorter thick spur.

VIOLA EMARGINATA (Nutt.), Le Conte. This is the plant which, at page 140 preceding, I have discussed under the name of *V. dentata*, Pursh. At the time of that writing I was trusting to the accuracy of Le Conte, who made out his *V. emarginata* and Pursh's *V. dentata* to be the same thing. But I am now wholly confident that in this he was wrong. Both Nuttall and Schweinitz had defined what they called the variety *emarginata* of *V. sagittata* as a plant with broad triangular foliage, while Pursh himself, and after him Schweinitz, had known *V. dentata* as a plant with oblong foliage. This most obvious difference is only one of several characters by which *V. dentata* and *V. emarginata* are perfectly distinct and readily distinguishable. True *V. emarginata* differs from *V. sagittata* not only in the broad deltoid outline of its foliage, but also in a pronounced succulency. Specimens of *V. sagittata* under good treatment dry perfectly, so as to admit of removal from the press after three or four days, while those of *V. emarginata*, under the same treat-

ment, require seven or eight days for drying. But my researches of the year 1897 have demonstrated that *V. emarginata*, and this only of all the immediate allies of *V. sagittata*, very commonly presents a foliage as much cut palmately as *V. palmata* itself; so that I have no doubt it may be found in several herbaria, under the name of *V. palmata;* from which, however, it is most easily distinguished, in whatever leaf-form, by the aerial and slender peduncles of its apetalous summer flowers.

VIOLA DENTATA, Pursh. This plant, in common with *V. ovata*, departs widely and altogether specifically from *V. emarginata* in having an oblong basally almost truncated foliage, the whole herbage being of a yellow-green, and the plant about twice as large, the flowers proportionately smaller. The petals, however, are emarginate in *V. dentata* as in *emarginata;* a circumstance which appears to have had too much weight with Le Conte, leading him to unite the two under the one name of *V. emarginata;* but a beautiful unpublished colored drawing of his, labelled *V. emarginata*, the drawing now in my possession, plainly represents what I take to be *V. dentata;* and it appears to be quite the same as Mr. Pollard's lately published *V. Porteriana*. Pursh's type, it must also be noted, was from quite the same region which furnished the type of *V. Porteriana*. Both Mr. Pollard and I seem to have been put off our guard as to *V. dentata* by accepting Le Conte's statement that it was the same as *V. emarginata*.

## EXPLANATION OF PLATES.

V.—*Viola emarginata*, the more typical form, with uncut trigonous foliage, as it appears at first flowering in spring.

VI.—Large æstival leaf of the same form, at time of later apetalous flowering.

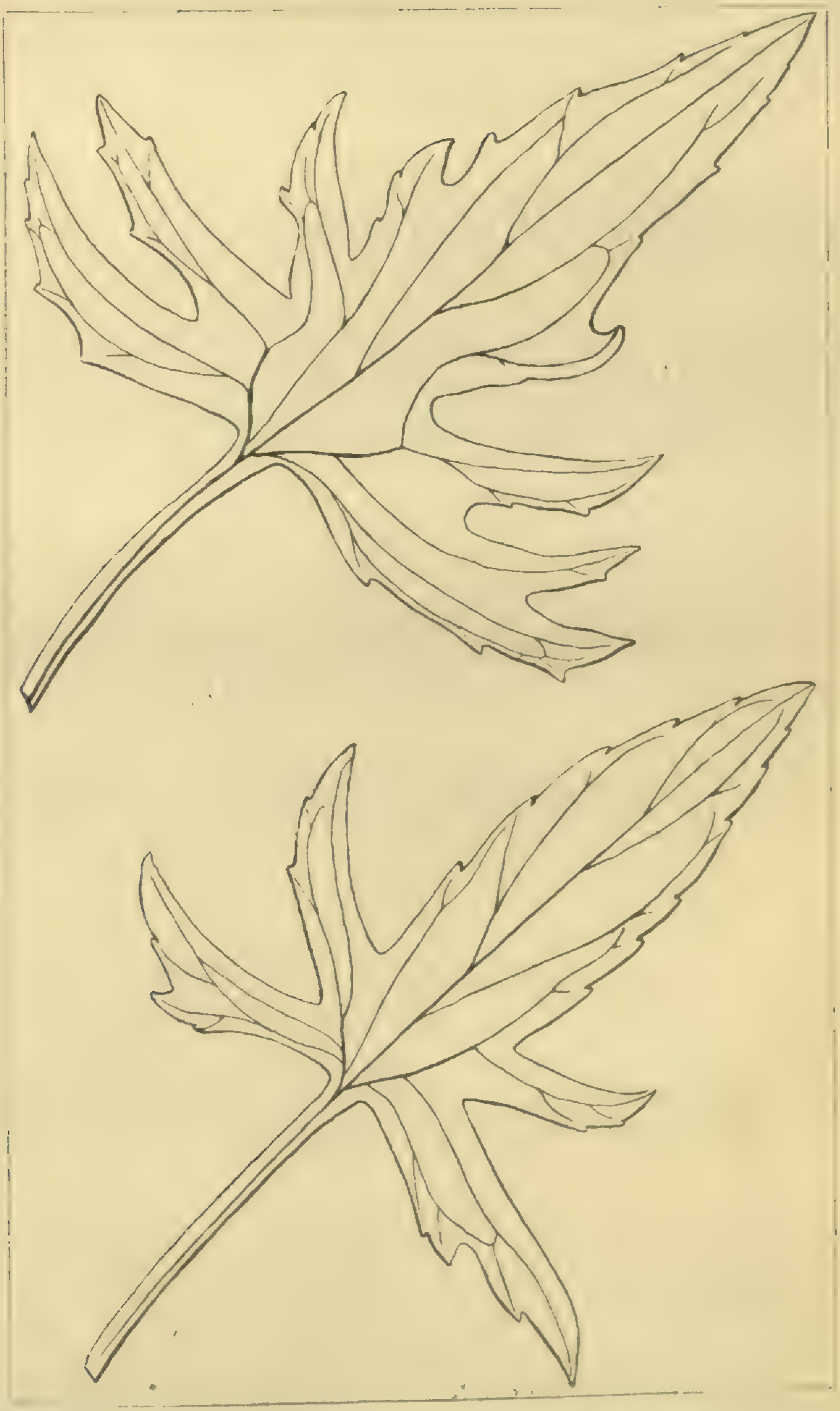
VII.—Cut-leaved form of the same species, at its vernal flowering.

VIII.—Large æstival foliage of the same palmated form. All the figures are of about the natural size; those of the mature leaves somewhat reduced from that.

VIOLA EMARGINATA (Nutt.) Le Conte.

VIOLA EMARGINATA (Nutt.) Le Conte.

VIOLA EMARGINATA (Nutt.) Le Conte.



VIOLA EMARGINATA (Nutt.) Le Conte.

ol. III. Part 18.

# PITTONIA.

## A Series of Botanical Papers

BY

EDWARD L. GREENE,

*Professor of Botany in the Catholic University of America,*

WASHINGTON, D. C.

February–April, 1898.

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## New or Noteworthy Species.—XXI.

Delphinium glareosum. Stems low, simple, from a long perpendicular cylindric and simple fleshy-fibrous root, the whole stem less than a foot high, and its lower one-half or one-third embedded with the root in loose gravel: lowest aerial parts of the plant glabrous and glaucescent; leaves all alike subsucculent, on long thick fleshy peduncles, and the lamina cut into oblong-linear obtuse callous-tipped segments; inflorescence, and also the lower face of the upper leaves loosely hirsute with somewhat deflexed hairs: raceme few-flowered, short and simple, little surpassing the tufted leaves: flowers rather small, deep blue, the ovate-oblong acutish petals and nearly straight slenderly subconic spur sparsely hirsute; follicles short, turgid, glabrous, erect.

In wet gravel, on the summit of Mt. Steele, Olympic Mountains, Washington, at 5,000 feet, Aug., 1895, C. V. Piper. Very distinct by its long deep simple root; in aspect more like the eastern *D. tricorne* than any other.

Myosurus major. Scapes numerous, 3 to 5 inches high, very long in proportion to the spikes, these slender conical, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long: summit of the achene oblong, though with some obscure angularity, traversed by a low thick not compressed beak, the base of the achene below the keel distinctly suberous-thickened; beak-like end of the keel very short, straight and erect.

Very common species of northern California, thence northward to British Columbia; always referred to *M. minimus* heretofore, from which its great size and notably different proportions of its scape and spike very readily distinguish it. In *M. minimus* the spike is commonly about the length

of the scape, often longer, seldom shorter, and, though manifestly a little tapering, can never be called slender-conical. Its keel is more slender and compressed, and the outline of the back of the achene more distinctly angular, even subrhombic. Excellently typical specimens of *M. major* were distributed by me from Siskiyou Co., California, in 1876; and I have never in any previous study of the genus felt satisfied in leaving the plant to figure as representing *M. minimus*.

MYOSURUS TENELLUS. Filiform leaves little more than an inch long; scapes also filiform, but rather firm and erect, three or four times the length of the leaves, the longest 5 inches: spikes very slender-conical, $\frac{1}{4}$ to $\frac{3}{4}$ inch long; achenes few and not very closely compacted, the summit of somewhat ovate-oblong outline, neither flattened nor bordered distinctly, the keel thick and obtuse, not compressed, showing a narrow furrow on either side, bounded by a more or less prominent nearly marginal nerve; beaks very short and straight.

Var. AMPHIOXYS. Leaves distinctly but very narrowly spatulate-linear: spikes less tapering: achenes somewhat rhombic-lanceolate at summit and pointed at both ends, terminally by the beak, and basally by a narrow appendage; the lateral nerves less distinct.

The type forms an almost grassy turf upon the desiccated mud of winter pools and ponds, in the western and middle sections of the State of Washington.

The variety inhabits moist woods about Spokane in the same State. Both are collected by Mr. C. V. Piper.

VIOLA VITTATA. Acaulescent, white-flowered: leaves almost linear (only slightly broader at the middle), 2 to 6 inches long, on petioles a third as long, the margins remotely and obscurely crenate, the apex obtuse, mucronate, lateral veinlets few, nearly parallel to the midvein: pe-

duncles notably shorter than the leaves, their bractlets long and almost filiform : petals small, narrow, white, but seeming brownish by the multitude of the dark parallel fine veins.

Florida, collected by Canby and by Curtis; also in southeastern Texas, E. Hall. Referred by all these collectors to *V. lanceolata;* but more unlike that than that is unlike *V. primulæfolia*, and readily distinguished by its short-petioled long vittaria-like leaves, and short-peduncled very venulose petals, long slender bractlets, etc.

VIOLA CAROLINA. Acaulescent and depressed, the root-stock stout and well elongated, the herbage rather thick and subsucculent: leaves mostly cordate-ovate and very obtuse, or the lowest round-cordate and as broad as long, none much exceeding an inch in length, all with broadly rounded basal lobes and a deep narrow sinus, the margins crenulate, not notably ciliate, the whole upper surface minutely hirsutulous, and this pubescence dense on the very short petioles and peduncles, these being almost plushy: peduncles little exceeding the leaves; sepals ovate-oblong, obtuse, only slightly ciliolate or not at all so: blue corolla rather more than $\frac{1}{2}$ inch broad, the petals with obovate-oblong blades, scarcely hairy at base; spur very prominent, thick, and broadly saccate-dilated at the end.

Dry ground near Wilmington, North Carolina, May, 1867, Mr. Canby; also by the same, near Savannah, Georgia, May, 1858. Referred to *V. cucullata* by Mr. Canby, to which the broad rounded leaves might suggest an affinity; but it is of the *V. sagittata* group, and nearest *V. ovata*, but wholly distinct from that by its depressed habit, broad leaves with rounded basal lobes and narrow sinus; the pubescence also very different. In the much enlarged spur it departs from the character of the group to which it belongs.

VIOLA PEDATIFIDA var. BERNARDI. Differs from the type in that the leaves are merely palmately lobed, the lobes

from oblong to linear-lanceolate, often quite entire, the clefts often not extending so far as to the middle of the leaf, the petioles very notably pubescent, as also even the leaf margin. The plant is known to me only as inhabiting the prairie regions of southern Wisconsin, in Rock and Dane counties; and it has always been taken for *V. palmata* by the students of Wisconsin botany, where true *V. palmata* does not occur. *V. ranunculifolia* of Jussieu might possibly be the same as the present plant, though that is described as glabrous; but it was founded on a specimen obtained by Michaux, whose travels did not extend so far north in the Mississippi Valley as the known habitat of *V. Bernardi.* I dedicate the plant as a variety or subspecies to Mr. Arthur Bernard Saunders, who has done me much service in furnishing both living and dried plants of the violets of Rock County, Wisconsin, a region with whose flora I had a better field knowledge forty years since than now.

Dr. Britton about a year ago was of the opinion that the plant was a distinct and undescribed species; but he has since receded from that view.

PRIMULA MACOUNII, Greene, p. 251, *supra.* Since the publication of this fine Northwest American insular species, formerly mistaken for *P. nivalis*, Mr. Theodor Holm has kindly procured for me, through some European correspondents of his, authentic *P. nivalis* from Siberia; and the points of difference between the two are more numerous than I had made out from descriptions and the original figure of *P. nivalis.* The foliage in this last is of much thinner texture, much more conspicuously veiny, even reticulately venulose, the reticulations showing central glandular dots. The dried leaf is so thin as to be perfectly translucent, and its margin is finely dentate, as Pallas' figure shows. But in *P. Macounii* the leaves are thick, completely opaque when dry, scarcely veiny, not in the least reticulate or dotted; nor is there any trace of farinose indument. The species is, then, not at all

to be contrasted with *P. nivalis*, its only real allies being our own Rocky Mountain and western species, *P. Parryi* and its allies, as I said in the earlier paragraph.

MERTENSIA LONGIFLORA. Less than a foot high, glabrous except the setulose-scabrous upper face of the foliage: lowest leaves elliptic-lanceolate, on long and slender petioles, the cauline obovate, oval or ovate, only the lower ones with a short spatulately tapering petiolar base, the others rounded or even cordate at base and closely sessile, the floral bracts acutish, all the proper foliage very obtuse, the largest leaves 2 inches long and about 1 inch in breadth: flowers in a rather dense strictly terminal and subcorymbose panicle: calyx rather large, cleft to near the base, the segments lanceolate: corolla about an inch long, with long slender tube and short erect narrow-campanulate limb: the almost capillary style nearly as long as the corolla.

Collected in eastern Washington in May, 1893, by Messrs. Sandberg and Leiberg, and distributed for *M. oblongifolia*, a species with narrow leaves, and flowers not half as long, the calyx-lobes linear.

MERTENSIA PAPILLOSA. Six to ten inches high, sparingly leafy, the leaves oblong, revolute, densely papillose above, the low papillæ bearing a minute short setose hair at summit: lower face of leaf smooth and glabrous, margin scabrous: flowers panicled: fruiting calyx short and campanulate, cleft to the middle, the lobes triangular, their margins pubescent, each lobe traversed by a stroug carinate midnerve: corolla small and almost tubular, the narrow limb with its shallow lobes apparently erect.

Species apparently peculiar to the parks among the mountains of Colorado; collected by Geo. Vasey, on Powell's Expedition in 1868, and by Canby, in South Park, 1871.

PLAGIOBOTHRYS PARVULUS. Habit of *P. tenellus* and with the same pubescence, but plant much smaller, only 3 to 5

inches high, very slender: nutlet scarcely $\frac{1}{2}$ line long, not at all granulate, but marked with close and low transverse rugosities which are straight, or some sinuate.

Near Castroville, Monterey Co., California, May, 1888, J. B. Hickman.

PLAGIOBOTHRYS ECHINATUS. Habit of *P. tenellus* and of the same size, rather more branching, the branches strict, densely spicate at summit; the usual pubescence augmented by sparse spreading and rather hispid hairs: nutlets rather more than $\frac{1}{2}$ line long, whitish, distinctly carinate on the back at least toward the apex, the transverse rugosities few, slender and indistinct, merely indicating the lines of numerous well elevated and sharp murications, the whole back thus appearing somewhat regularly echinate.

Cedar Hill, Vancouver Island, 16 May, 1887, Mr. John Macoun.

PLAGIOBOTHRYS COLORANS. Taller and stouter than *P. tenellus*, with shorter and more strict branches, the main stem simple and naked below; whole herbage hirsute, dark-colored when dry, deeply staining the papers dark-red or purple: nutlets vitreous-shining but colorless rather than gray or whitish, the numerous low but sharp rugosities somewhat sinuate and entire, the intervening spaces presenting scattered but prominent murications.

Collected at Hornbrook, near the summit of the Siskiyou Mountains in northern California, 15 May, 1889, by Mr. Thomas Howell. Quite like *P. Torreyi*, and unlike all other species, of its own group, in its dark-colored and staining herbage.

PLAGIOBOTHRYS ASPER. Of the *P. tenellus* group, but larger than the others and rather diffusely branched or many-stemmed from the rosulate tuft of basal leaves, the branches hispid, floriferous almost throughout, many of the calyxes subtended by a leafy bract; leaves rather roughly hirsute or

almost hispid: calyx large, and nutlets ¾ line long, vitreous and shining, lineately rugose transversely and with or without murication.

Frequent from northern California to Washington. Easily distinguished at sight by its large size, its many stems, and stiff harsh pubescence.

LITHOSPERMUM LAXUM. Perennial, 1 to 1½ feet high, ascending or suberect, loosely and rather widely branched from near the base; herbage green, or very slightly canescent with an inconspicuous appressed pubescence: flowers small, greenish-yellow, in the axils of the leaves or large leafy bracts, these oblong-lanceolate, 1½ inches long, the cauline leaves narrower and more elongated: nutlets large, ovate, abruptly obtuse-pointed.

West Humboldt Mountains, Nevada, collected by the author in July, 1894, the plants at the time in both flower and fruit. Species somewhat intermediate between *L. Californicus* and *L. pilosum*.

ERIOGONUM PIPERI. Habit and inflorescence of *E. flavum*, nearly, but plant taller and scape slender, the whole herbage villous rather than tomentose, except the lower face of the leaf: leaves thin, the elliptic-lanceolate or oblanceolate blade an inch long or less, much shorter than the slender petiole; whorl of leaves subtending, the umbel narrow and distinctly slender-petioled: umbel of 5 to 8 short equal rays: perianth greenish yellow, tipped with scarlet in age, hirsutely rather than silkily villous, and narrowed below to a long stipe-like base: achene woolly-hairy at apex.

Blue Mountains of eastern Washington, at an altitude of about 5,000 feet. Readily distinguished from its eastern Rocky Mountain ally, *E. flavum*, by its different foliage and pubescence, and by the long slender stipe-like base of its perianth.

# Studies in the Compositæ.—VII.

## 1. *Some Helenioid Genera.*

Our North American plants forming the types of *Gaillaridia*, *Actinella* and *Picradenia* are possessed of no characters of achene and pappus by which they may be distinguished as genera; and the only botanist of the last half century who has shown any approach to consistency in the treatment of them was the late M. Baillon, who merged them all in one, under the oldest name, *Gaillardia*. Asa Gray left *Gaillardia* as originally constituted, but merged in one Nuttall's *Actinella* and Hooker's *Picradenia*, which was manifestly an inconsistency; an arbitrary procedure, backed by no phytological reason whatsoever; for Nuttall's *Actinella acaulis*, the type of his genus, is much nearer *Gaillardia* than it is to *Picradenia*, both habitally and in characters of calyx, flowers, etc. It would have been decidedly more reasonable and philosophic to have followed Pursh, who never doubted that *A. acaulis* Nutt., was a true *Gaillardia*.

Baillon paid no heed to habital marks as indicating generic limits. Gray, on the other hand, professed to heed them, but nevertheless put *Actinella* and *Picradenia* together, which are as totally dissimilar in habit as any two genera that can be named among the Helenioideæ. They are also well enough fortified as separate genera, by very notable differences as to their involucres, as was long since pointed out by Sir William Hooker, and also by good characters of their ray-corollas, as I shall indicate.

*Actinella* as employed by Nuttall and by Gray is a homonym. Persoon had early applied it to a different genus. Rafinesque's *Ptilepida* is but a synonym of Persoon's (not Nuttall's) *Actinella;* and its use, attempted in the recent Check

List,[1] as applying to North American plants, is precluded. I therefore here assign this group the name

## TETRANEURIS.

Of this genus, very easily recognizable by habital peculiarities, the essential characters are (1) an involucre of thin soft herbaceous bracts all distinct, and, though biserial, all alike; (2) a merely low-conical receptacle; (3) quadrate rays not dilated at the 3-toothed summit, and marked by just four parallel simple nerves (whence the name); (4) very broad anther-tips, as broad as long.

Of this I recognize the following species:

### * *Peduncles scapiform and leafless.*

1. T. ACAULIS. *Galardia acaulis*, Pursh, Fl. ii. 743 (1814). *Actinella acaulis*, Nutt. Gen. ii. 173 (1818). *Cephalophora acaulis*, DC. Prodr. v. 663 (1836). *Ptilepida acaulis*, Britton, Mem. Torr. Club, v. 339 (1894). Tufted and almost subligneous perennial of bleak hills, with silvery-silky foliage, frequent along the Rocky Mountains from New Mexico to Assiniboia.

2. T. TORREYANA. *Actinella Torreyana*, Nutt. Trans. Am. Phil. Soc. vii. 379 (1841). *A. glabra*, A. Nelson. Fl. Wyom. 137, not of Nuttall. Certainly one of the best of species by its almost glabrous strongly punctate foliage, and scarious-margined bracts of the involucre, awnless pappus, etc. No one has yet noticed that in this species alone the flowers have a greenish-yellow shade.

3. T. LANATA. *Actinella lanata*, Nutt. l. c. Comparable with the last, but very dwarf and woolly, especially as to scape and involucre, the bracts of the latter scarious-margined; the leaves also very woolly when young, but in age

[1] Mem. Torr. Club, v. 339.

glabrate except at base, and nearly impunctate at all stages. Species still rare in collections, but most distinct; wholly of the Rocky Mountain region, like the one preceding.

4. T. DEPRESSA. *Actinella depressa*, Torr. & Gray, Pl. Fendl. 100 (1849). A peculiar pulvinate-cæspitose plant still little known, and from western Colorado or adjacent Utah.

5. T. BREVIFOLIA. Densely matted on the surface of the ground (the caudex not, as in the last, mainly subterranean); leaves crowded and imbricated on both floriferous and sterile branches, the whole leaf only ½ to ¾ inch long, the oblanceolate subulate-cuspidate blade no longer than the equally broad scarious base: slender scapes ½ inch high: bracts of the small involucre few, ovate-lanceolate, acutish, densely silky-villous, as is also the upper face of the minutely but closely puncticulate leaves: rays few and small, or wanting.

Summit of a bleak ridge above timber line, on Pike's Peak; collected only by Mr. Canby.

6. T. ARIZONICA. Size and habit of the common *T. acaulis*, but less ligneous-cæspitose, the oblanceolate acute leaves loosely villous-hirsute or silky and strongly punctate, of comparatively thin texture, the base scarious and very hirsute at the insertion: bracts of the involucre oval or oblong-ovate, obtuse: paleæ of the pappus obtuse but abruptly pointed with a subulate long awn.

Treadwell, Arizona, Edw. Palmer, 1877 (n. 259); also at Peach Springs, Rusby, 1883, the latter more silky than those by Dr. Palmer.

7. T. SCAPOSA. *Cephalophora scaposa*, DC. Prodr. v. 663 (1836). *Actinella scaposa*, Nutt. l. c. Whole plant very villous: lowest leaves very broadly, the others narrowly lanceolate, acute, entire or pinnatifid with acute not deep lobes, the punctuation of the leaf-surface sparse, obscured by the silky indument: involucre densely villous-tomentose.

A rather rare species of southwestern Texas and adjacent New Mexico. The great bulk of the material in our herbaria named *Actinella scaposa* is of the next species.

8. T. LINEARIS. *Actinella scaposa* var. *linearis*, Nutt. Trans. Am. Phil. Soc. vii, 379 (1841). Cæspitose but the short caudex slender: leaves very narrow and almost linear, pubescent but not villous, the punctuation manifest, but superficial rather than impressed: scapes tall and slender: paleæ of the pappus obovate, obtuse, tipped with a rather long awn.

The most common species of the Texano-New-Mexican region, and, as I have before intimated, plentiful in the herbaria under the name of *Actinella scaposa*.

9. T. AUGUSTATA. Apparently not cæspitose, the stems solitary or several from slender and deep-seated perennial roots: leaves elongated and narrowly spatulate-linear, sparsely villous-pubescent and impressed-punctate, the scarious margins of the petiolar base serrulate-scabrous or somewhat ciliate: scapes very slender, a foot high; involucre somewhat silky-tomentose, the bracts unequal, obtuse: paleæ of the pappus obovate, deeply notched, a short awn proceeding from the notch.

Obtained in the State of Chihuahua, Mexico, in 1886 (n. 953), in the month of November, in full flower at the time; therefore an autumnal species, all the others being vernal.

10. T. TRINERVATA. Branching caudex stout and low, densely leafy: leaves firm, spatulate-linear, acute, sparingly and rather superficially punctate under a dense short silvery appressed pubescence, the petiolar base coriaceous, entire, glabrous except at the villous insertion, strongly 3-nerved: scapes 2 or 3 inches high, little exceeding the leaves: bracts of the involucre somewhat tapering upward from the middle.

Sandia Mountains, New Mexico, J. M. Bigelow; the type specimens in the herbarium of Columbia College.

11. T. FASTIGIATA. Subligneous stem 6 or 8 inches high, parted into many fastigiate densely leafy branches and forming a compact tufted undershrub-like plant: leaves spatulate-linear, acute, glabrous or somewhat scabrous, superficially punctate, the basal part much dilated, with strong midvein and no lateral nerves, the margin hirsute with long deflexed hairs: scapes slender, shorter than the leafy branches but 3 to 5 inches long: involucre narrow and small, its bracts oblong, obtuse, pubescent.

Inhabiting dry hills, Coolidge County, Kansas, collected by B. B. Smyth, 22 Aug., 1890; the plant then long past flowering. The only specimen seen is in the herbarium of Columbia College.

12. T. GLABRA. *Actinella glabra*, Nutt. Trans. Am. Phil. Soc. vii. 379 (1841). Near of kin to *T. acaulis* and *T. Torreyana*, more herbaceous than either, nearly glabrous, leaves much less punctate, and the involucral bracts not scarious-edged.

Good specimens of this species, which is of the Rocky Mountain plains rather than of the foothills, or mountains, were obtained by Hall and Harbour, and also in 1868 by Geo. Vasey. But it has seldom been collected, and is rare in herbaria.

13. T. HERBACEA. Much larger than the last, wholly herbaceous even to the branched crown of the root, theleaves slightly fleshy or subcoriaceous, oblanceolate and linear-lanceolate, impressed-punctate, but the dots small, appearing glabrous, but sparsely villous-pubescent under a lens: stout scape villous-tomentose at summit; bracts of the involucre subequal, oblong, very obtuse, the inner ones with narrow and erose scarious margins: rays with obvious traces of partly disconnected veins between the four usual ones and accessory to them: oblong-ovate paleæ of the pappus obtuse or acute, some apiculate.

Central Illinois and Ohio; wholly removed from the rest of the genus both in habitat and in character; though figuring in some books as a part of *Actinella acaulis*.

* * *Perennials, the subscapiform peduncles leafy.*

14. T. ARGENTEA. *Actinella argentea*, Gray, Pl. Fendl. 100 (1849). Frequent along the Rio Grande in New Mexico. Readily known by its dense and close silvery-silky pubescence.

15. T. IVESIANA. Caudex stoutish and subligneous, the older parts ferruginous-hirsute after the falling of the old leaves: leaves spatulate-linear, glabrous and punctate above, hirsute beneath: scapes 3 to 6 inches high, sparingly leafy: bracts of involucre broadly oblong, glabrate and purplish toward the summit but the margin villous-ciliate: paleæ of the pappus narrowly obovate, abruptly long-acuminate but with no awn.

Collected on the Rio Zuni by Woodhouse in 1851; also by Dr. Newberry, on Ives' Expedition, 14 May, 1858. The only specimens seen are in the herbarium of Columbia College.

* * * *Branching annuals or biennials.*

16. T. LEPTOCLADA. *Actinella leptoclada*, Gray, Pac. R. Rep. iv. 107 (1857). Southwestern Colorado to New Mexico and Arizona.

17. T. LINEARIFOLIA. *Hymenoxys linearifolia*, Hook, Ic. t. 146 (1838). Western Louisiana and adjacent Texas.

18. T. OBLONGIFOLIA. Annual, erect, rather strict, a foot high, with a few long naked pedunculiform branches from about midway of the stem: leaves oblanceolate to oblong and linear-oblong, obtuse; stem and basal parts of the leaves silky-villous.

Guajuco, Nuevo Leon, Mexico, 1880, Edw. Palmer (n. 677), distributed as *Actinella linearifolia*, from which its green (not silvery-canescent) herbage, and broader obtuse leaves, as well as its mode of branching. thoroughly distinguish it.

## RYDBERGIA.

Stout but low upright sparingly branched alpine woolly perennials, with very large heads with long and narrow spreading yellow rays. Bracts of the low-hemispherical involucre all alike, distinct, herbaceous, in several series, loose, woolly. Receptacle broad and hemispherical. Rays 15 to 30, an inch long or somewhat less, linear-cuneiform, broadest and deeply 3-toothed at apex. Paleæ of the pappus white (not transparent as in *Tetraneuris*), elongated-lanceolate and sleuderly acuminate.

Dedicated to Mr. Per Axel Rydberg.

1. R. GRANDIFLORA. *Actinella grandiflora*, Torr. & Gray, Journ. Bost. Nat. Hist. Soc. v. 110 (1847). Alpine summits of the Rocky Mountains from Colorado to Montana.

2. R. GLABRATA. *Actinella grandiflora;* var. *glabrata*, Porter & Coulter, Fl. Colo. 76 (1874). *Actinella Brandegei*, Porter in Gray, Proc. Am. Acad. xiii. 373 (1878). High peaks of southern Colorado to southern New Mexico.

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That Sir William Hooker's PICRADENIA is alien to both the foregoing is doubly attested by its peculiar habit, and the extremely different involucre. This organ is distinctly double, being made up of an outer series of narrow and rigid bracts which unite at base and form a sort of cup enclosing an inner series of separate broader ones. Their rays are few, short, cuneiform and with a less simple nervation than those of *Tetraneuris*. As in that genus the northern and typical species are perennial, while several of the more southerly ones are annual.

**Perennials, or at least biennial.*

1. P. RICHARDSONII, Hook. Fl. i. 317, t. 108 (1833). *Actinella Richardsonii*, Nutt. Trans. Am. Phil. Soc. vii. 379 (1841). The type is from the plains of British America, but the species seems to extend well southward in the Rocky Mountains, in the Cascades, and even to high plains of the Great Basin.

2. P. PUMILA. Perennial, somewhat cæspitose, the deep tap-root surmounted by a multicipitous caudex: lowest leaves linear, entire, the more strictly cauline parted into 3 to 5 linear segments: stems only 3 or 4 inches high, decumbent at base, mostly monocephalous: involucre as in the preceding, and flowers similar but pale-yellow: achenes densely white-silky; paleæ of the pappus ovate-lanceolate, acuminate but not aristate or mucronate.

On dry clayey hills of Rock Creek, western Wyoming, 10 July, 1896.

3. P. CANESCENS. *Actinella Richardsonii*, var. *canescens*, Eaton in Bot. King Exp. 175 (1871). Small and slender perennial with branching caudex, wholly whitish with a soft tomentum: leaves on slender petioles, these with 3 to 5-nerved dilated base; the blade consisting of 3 palmately inserted linear leaflets: involucre campanulate, its broad outer bracts 3-nerved at base: paleæ of the pappus ovate, acuminate but scarcely awn-tipped.

East Humboldt Mountains, Nevada; collected only by Sereno Watson.

4. P. RUSBYI. *Actinella Rusbyi*, Gray, Proc. Am. Acad. xix. 33 (1883). A large green and glabrous corymbose-panicled species known only from the Mogollon Mountains, New Mexico.

5. P. VASEYI. *Actinella Vaseyi*, Gray, Proc. Am. Acad. xvii. 219 (1882). Known only from the Organ Mountains, New Mexico.

6. P. Cooperi. *Actinella Cooperi*, Gray, Proc. Am. Acad. vii. 359 (1868). Somewhat like the last; but of the mountains of the Mohave Desert region in California.

7. P. Lemmoni. Evidently perennial, glabrous and strongly punctate, the rather slender stems 1½ feet high, not rosulately nor densely leafy at base; the lowest leaves on rather coarse elongated erect petioles 5 or 6 inches long, the blade only 2 inches, pinnately cut into about 3 pairs of divaricate linear lobes: heads middle-sized in a corymbose cyme; bracts of the involucre subequal, the outer series ovate-lanceolate, the inner oblong, obtuse.

Mountains of California, probably northward; collected only by J. G. Lemmon, and by Dr. Gray, erroneously referred to his *A. biennis*.

8. P. floribunda. *Actinella Richardsonii*, var. *floribunda*, Gray, Pl. Fendl. 101. Taller and more slender than *P. Richardsonii*, the wool at base of stem more silky; stems repeatedly branched; heads many times more numerous, of less than half the size, forming a broad flat-topped inflorescence: paleæ of the pappus lanceolate, some slenderly accuminate, others not so.

Foothills and plains about Santa Fé, New Mexico.

* * *Annuals, or the first possibly biennial.*

9. P. biennis. *Actinella biennis*, Gray, Proc. Am. Acad. xiii. 373 (1878) in part, excluding the *Actinella Richardsonii*, var. *biennis*. Probably only a winter annual; stoutish, erect and rather strict, 2 feet high, glabrous, thin-leaved, punctate; lowest leaves 3 inches long, petiolate, simple and linear, or some with 3 to 5 narrowly linear segments, the middle cauline sessile, simple or pinnate: heads small, terminating the long strict branches: involucre hemispherical, its outer bracts ovate-lanceolate, slightly joined, traversed by a strong midrib: pappus paleæ with subulate point as long as the ovate body.

Rock Creek, Utah; collected only by E. Palmer, 1877 (n. 261).

10. P. MULTIFLORA. *Philozera multiflora*, Buckley, Proc. Philad. Acad. 1861, p. 459. *Actinella odorata*, Gray, as to plant of the U.S., but not *Hymenoxys odorata*, DC. Common winter annual of Texas and New Mexico, flowering in early spring; herbage wholly scentless, the plant also in other particulars much at variance with the Mexican *Hymenoxys odorata*, which may or may not be of this genus.

11. P. TEXANA. *Actinella Texana*, Rose, Bot. Gaz. xvi. 27 (1891). An interesting dwarf annual, of peculiar aspect, but of this genus strictly, according to character of inflorescence, involucre and fruit.

## 2. *Some northern species of* ANTENNARIA.

The entire collection of *Antennaria* belonging to the Museum of the Geological Survey of Canada was sent me some time since, by Mr. James M. Macoun, with the request that I identify the species. The genus is prevailingly a boreal one, and the British American material which has been amassed during many years, by the zeal of the Messrs. Macoun and their several helpers, has proven a most interesting study; so that I am constrained to place on permanent record the results of what has been a somewhat laborious piece of research. Upon several of the species, particularly such of them as extend their range to our side of the British Boundary, I have gained valuable information from the copious materials of the U. S. Herbarium here in Washington; while Mr. E. P. Bicknell of New York has given me the benefit of some late summer specimens obtained by himself on Mt. Desert Island off the coast of Maine. The Greenland allies of our more extremely boreal forms are richly exemplified in the herbarium of Mr. Theodor Holm, which has been at my disposal.

The arrangement or succession of species which I take to be quite natural is based, first upon the color of the in-

volucral bracts as white (varying to pink) or as brown; these primary groups being subdivided according to the permanency or the deciduousness of the tomentum upon the upper surface of the foliage.

**Tips of involucral bracts white or pink.*

*+ Leaves glabrous, or at least glabrate, above.*

A. DIOICA, Gærtn. *A. montana*, S. F. Gray, Nat. Arr. ii. 458. Under this name it is evident to me that two or more species are included even in Europe. The proper type of *A. dioica* is a low plant with long and sparingly leafy stolons, leaves of spatulate or obovate-spatulate outline and acute, their upper surface glabrous or early glabrate: bracts of the involucre with long and obtuse white tips. An excellent representation of this plant is given in Smith and Sowerby's *English Botany*, iv. t. 267.

There is nothing to show that this plant exists in any part of North America; but the first four following are akin to it.

A. NEGLECTA, Greene, p. 173 *supra*. As I indicated when publishing this as new, both Barton and Darlington supposed it to be *A. dioica*, a view far less objectionable than that of those who afterwards referred it to *A. plantaginifolia*. It differs from its Old World homologue in its much greater size, much longer and less leafy stolons, different leaf-outline, and in the longer and narrower often acute scarious tips of its involucral bracts.

I described this from the plant as it appears in the vicinity of Washington, where it is a common inhabitant of open and rather moist grassy lands. It does not appear in our herbaria from more southerly stations; though in view of what we know of its habitat, it might be expected in meadows among the higher mountains well southward; but it is plentiful northward to at least southern New England. Mr. Bicknell obtained it on Mt. Desert Island; but it does not

appear to have been collected in any part of Canada, though one can hardly doubt the possibility of its being found somewhere along the southern borders of that country.

A. CANADENSIS. Of the size and general aspect of *A. neglecta*, but the stolons less elongated, assurgent rather than procumbent; leaves as long, as narrow, quite as destitute of venation, but acute at apex, and far less spatulate, *i. e.*, more distinctly differentiated into blade and petiole: bracts of involucre all narrower, much less conspicuously and differently tipped, the chartaceous body of the bract more naked (as to wool), much longer, and in the innermost very narrow ones produced upward almost to the summit, this only marginally white, and acuminate.

A Northeast Canadian homologue of *A. neglecta;* necessarily held distinct from it on account of its very different involucre; though as indicated, the habit and the foliage are also, in a degree peculiar. The male plant is not known to me. The female is beautifully exemplified in the Canadian Survey collection by sheets n. 11293, from Lake Mistassini; 11285, from Prince Edward Island; 11294, from Jupiter River, Anticosti, and n. 11299, from Campbellton, New Brunswick, this last collected by R. Chalmers, all the others by the Messrs. Macoun.

A. CAMPESTRIS, Rydb. Bull. Torr. Club, xxiv. 304. Species well defined by Mr. Rydberg, yet apparently known to him chiefly from along the southern limits of its range. From the Canadian Survey collection it appears as if it were plentiful on the bleak plains of middle and western British America. In that collection the following numbers belong to it: 12276, from rocky fields, Stonewall, Manitoba, Macoun, 2 June, 1896; 11290, in dry gravelly soil, Souris Plain, Assiniboia, Macoun, 28 June, 1883; 13941, on the open prairie, Prince Albert, Saskatchewan, Macoun, 30 June, 1896; 14373, from the open prairie, Indian Head, Assiniboia, Spreadborough, June, 1892.

A. Howellii, Greene, p. 174 *supra*. This also, when published by me, was known only from what now appears to be its southern limit, Mt. St. Helen, Oregon. It now proves to be just the Pacific Coast homologue of *A. neglecta*, and abundant in British Columbia and regions adjacent. It is represented in the Canadian Survey collection by all the numbers following: 427, in open places near Victoria, Vancouver Island, May, 1893, Macoun; 11287, gravelly hillsides, Goldstream, Vancouver Island, 20 May, 1887, Macoun; 11284, in open woods, Agassiz, British Columbia, 8 May, 1889, Macoun; 11289, dry woods and banks, Blackwater River, B. C., 10 June, 1875, Macoun; 5219, on grassy banks, Spray Avenue, Banff, 30 June, 1891, Macoun; 11281, in dry gravelly soil, Crows' Nest Pass (East of the Lake), 8 July, 1883, Dawson.

A. insularis. Low and with short stolons: leaves short, spatulate-obovate, abruptly acutish or mucronulate, glabrate above: stem 2 or 3 inches high, leafy-bracted: heads 5 or 6, of middle size, on short pedicels or sessile: bracts of female involucre with large obovate-spatulate to spatulate-linear white tips; those of the male involucres hardly broader or shorter, but all obtuse: bristles of pappus in the male with rather short and not very ampliate spatulate tips.

Islands off the Alaskan coast. Kiska Island, M. Baker, 1873, and Adakh Island, C. H. Townsend, 1893.

A. Macounii. Low and slender, doubtless forming extensive mats, the stolons slender and flexible, 2 inches long: obovate-spatulate thinnish leaves white-tomentose when growing, and equally so on both faces, but the second year perfectly glabrate and green: stems only 2 or 3 inches high, with a few narrow linear acuminate leaves: heads 2 to 5, subsessile: bracts of involucre few, woolly at base, their naked tips brownish, oblong-linear, obtuse or acutish.

Very well marked species, represented by a single collec-

tion made by Mr. John Macoun, at Revelstoke, B. C., in 1890, number 11241; all the specimens female.

A. SUFFRUTESCENS. Low evergreen undershrub, the rigid procumbent branches leafy throughout; the small coriaceous leaves obcordate at summit, thence tapering abruptly to a nearly linear basal part, the whole tomentose beneath, glabrous and deep green above: peduncles 2 to 4 inches high, clothed with reduced spatulate retuse or emarginate leaves: heads solitary, not large; involucre campanulate; bracts of the pistillate with much reduced and acute scarcely whitened tips; those of the staminate much more ample, white, obovate, emarginate: bristles of pappus in the male with evident though narrow and serrulate apical dilatation.

Most beautiful almost heath-like species, obtained only by Mr. Thos. Howell, near Waldo, Oregon, 8 June, 1884.

A. PLANTAGINIFOLIA, Hook. I make mention of this under the heading of northern species of *Antennaria* for no better reason than that hundreds of herbarium sheets from the north are labelled by that name, and that it figures in all our books and catalogues as a northern species. It is in truth mainly of Virginia and Maryland; doubtless also occurring in New Jersey and southern Pennsylvania. There is no trace of it among Canadian specimens as known to me.

A. PARLINII, Fernald. This is probably quite as limited in its range as many others. It does not seem to occur except along the New England seaboard.

A. PETASITES. Stoloniferous, but the stolons and their foliage not known: stoutish stems 8 to 12 inches high, sparingly leafy below, the leaves glabrous above, floccose-tomentose beneath, those of the lower and middle portion of the stem an inch long, linear-lanceolate, acute, those on the branches of the somewhat cymose-panicled inflorescence

much broader and somewhat ovate-lanceolate: bracts of the involucre (the female plant only) all elongated, the greenish or reddish herbaceous basal part passing gradually to the very thin oblong obtusish and linear acuminate scarious tips.

Sterile knolls and banks, Drew's Harbour, British Columbia, 14 May, 1876, Dawson; sheet n. 11292 of the Canadian Survey collection. Evidently a northwestern maritime ally of the eastern *A. plantaginifolia;* very peculiar in its broad-bracted and somewhat panicled inflorescence, the flowering stems suggestive of those of some smaller *Petasites.*

+– +– *Upper face of foliage permanently more or less woolly.*

A. DECIPIENS. Of the large dimensions, short stolons, broad petiolate triple-nerved leaves, and the general habit of *A. plantaginifolia*, but leaves of thin texture, never glabrate above, but always, even in full maturity, pale with at least a thin and sparse lanate or floccose tomentum, the ground color a dark green: scarious tips of the involucral bracts in the female plant narrow and acute.

While ransacking the wild and waste places about Washington last May, in quest of male plants of *A. plantaginifolia,* I came at last to an extensive field of exclusively male plants which, though growing in different soil, and under less exposure, and also presenting what I took for a less promptly deciduous indument, I allowed to pass for the species above named. In my distribution of authentic specimens of what I had called *A. plantaginifolia,* I sent out, in each instance, female *A. plantaginifolia* and male *A. decipiens;* and did this all the while half apprehending that I might be acting indiscreetly. Later in the season, as the foliage of the female plants in every field about me grew larger and more plantain-like, even more fleshy and firm in texture, retaining its bright green hue, that of my male ones in the woodland station remained thin, retained all its

hoariness, and even shrivelled up under the influence of the summer heats; and I had not much sooner come to a full realization of having confused two species than my friend Mr. Pollard informed me that he had reached the same conclusion. *A decipiens* is manifestly a northern species, reaching its southern limit in Maryland and Virginia, and being much more common in Pennsylvania and New York, ranging westward to the prairie region toward the Mississippi or even beyond it, and northward to Mt. Desert Island, whence Mr. Bicknell has it. It is also in the Canadian Survey collection, under the following numbers: 11295, in dry woods, vicinity of Belleville, Ontario, 20 May, 1878, Macoun; 11298, sandy woods, Nipigon, Lake Superior, 24 June, 1884; also forming part of a much confused sheet n. 11296, the one specimen of true *A. decipiens* being ticketed, "Woods and meadows near Belleville, 28 May, 1865." In northern and western specimens it appears in both male and female forms. Near Washington the female plant of *A. decipiens* is as much unknown as is the male of *A. plantaginifolia*, hence my former strong inclination to make of the two the mere sexes of one species.

A. FOLIACEA. More than a foot high, slender, the short stolons densely leafy, their leaves cuneate-obovate to obovate-spatulate, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, very broad in proportion to their length, acutish, of thin texture, lightly and permanently silky-tomentose on both faces; cauline leaves much larger, 1 inch long or more, oblong or spatulate oblong, sessile and clasping, very obtuse or even almost truncate at the broad apex; heads rather slenderly pedicellate in a compound cyme; involucres not large, their bracts in only about two series, the white tips of the outer series oval, obtusish, of the inner lanceolate, acute.

Little Belt Mountains, Montana, 18 Aug., 1896, J. H. Flodman, n. 867. Remarkable for the very ample cauline leaves, these less hoary and several times larger than those of the stolons.

A. PEDICELLATA, Greene, p. 175 *supra*. Nothing can here be added to the first account given of this species. It has been collected only by Mr. Cusick; and the region yielding it is not yet well explored.

A. NEODIOICA, Greene, p. 184 *supra*. This has for its center of distribution the mountain districts of northern Pennsylvania. I have found it in Maryland, near Marshall Hall, on the Potomac. It occurs in the vicinity of New York City; and Mr. Bicknell has collected it as far north as Mt. Desert Island; but there is not yet any evidence of its occurring in Canada.

A. HYPERBOREA, Don, in Engl. Bot. Suppl. t. 2640. *Gnaphalium hyperboreum*, Withering, Arr. 7 ed. iii. 926. This is typically a plant of northern Europe, where it usually passes for *A. dioica*, though it differs from that constantly in having the usual hoariness as permanent upon the upper as upon the lower faces of the leaves. It occurs in Greenland, and I refer to it without much hesitancy a high-northern specimen collected by Miss Elizabeth Taylor, at Fort Smith, on Great Slave River, in 1892. This is preserved in the collection of the Canadian Survey on sheet n. 11264.

A. PARVIFOLIA, Nutt. Trans. Am. Phil. Soc. vii. 406, as to the specific character (drawn up from the male plant), but excluding the female plant with "purple" bracts mentioned in the note. *A. microphylla*, Rydb. Bull. Torr. Club, l. c. Nuttall undoubtedly confused two different plants in publishing his *A. parvifolia*; and that from which he drew his formal specific character must certainly be taken as the type, that is, the dwarf plant, with broad cream-colored or white involucral bracts. These bracts are yellowish or white, very broad, and obtuse or even truncate in the male plant, but narrower and pinkish in the female. The lowest cauline leaves in this are distinctly spatulate-dilated upwards, and also definitely one-nerved.

The species is rather rare in the herbaria. All Mr. Rydberg's citations for his *A. microphylla* belong to it, as also those distributed from the Laramie Plains, Wyoming (as *A. dioica*), by Mr. C. S. Sheldon. It is beautifully represented in the Canadian Survey by n. 10907, East End Post, Cypress Hills, Assiniboia, and n. 10906, from Sheep Mountain, Alberta. The male plant, at least in the herbaria, is more common than the female.

A. ROSEA. *A. dioica*, var. *rosea*, Eaton, Bot. King Exp. 186. *A. parvifolia*, var. *rosea*, Greene, p. 175 *supra*. *A. parvifolia*, Nutt. in small part, but not of spec. char. Plant by no means small, often 12, sometimes 14 or 15 inches high, yet frequently only 6 or 8 inches: leaves comparatively small, of the thinnest, as to texture, only canescently tomentose, but permanently so on both faces, the quite gradually dilated upper portion acute; cauline long and narrow, acute or acuminate: heads small, closely compacted in a compound cymose rounded cluster: bracts of the involucre pluriserial, their basal part concealed by wool, the tips from broad and obtuse in the outer series to narrow and acute in the inner, all rose-red.

Of this only the female plant is known to me; which is the more remarkable in view of the fact that no other northwestern *Antennaria* so abounds in every large herbarium. It is a dry-ground species of subalpine habitat, with either short or elongated slender dry and subligneous stolons; in this quite unlike the true *A. parvifolia*. From *A. hyperborea* it is more difficult to distinguish it, except by the looser inflorescence, longer heads, less woolly involucre, and fewer paler narrower bracts of the last named. I give the following rather copious list of localities for *A. rosea*. North Park, Colorado, Chas. S. Sheldon, n. 128; Yellowstone Park, Frank Tweedy, n. 728; mountain meadows in Kootenai Co., Idaho, J. B. Leiberg, n. 646; Nez Perces Co., Idaho, Heller, n. 3441; Salmon River, British Columbia, Dawson (Can. Surv. n.

11281); Spence's Bridge, B. C., Macoun, n. 11282; summit of Mt. Arrowsmith, Vancouver Island, Macoun, n. 11279; pine woods near Spokane, Washington, C. V. Piper, n. 2273; Mt. Hood, Oregon, Thos. Howell; Crooked Creek, southeastern Oregon, and Warner Range, northeastern California, Mrs. Austin.

A. APRICA. Cæspitose, stout and low, the stolons short, ascending, crowded and leafy: cuneate-oblanceolate acutish leaves less than an inch long, rather densely silvery-tomentose on both faces; stems usually about 3 inches high, leafy-bracted, the bracts suberect, narrow, very acute, more than ½ inch long; heads 3 to 6, large for the plant, sessile or the pedicels very short; bracts of the involucre much imbricated in rather numerous series, all with short woolly base, the rather dull-white or creamy tips very unequal, those of the outer series very short and obtuse, of the others successively longer, passing from obovate to oblong and oblong-lanceolate, and from obtuse or almost truncate to acutish, or some tridentate, all more or less distinctly and evenly serrulate.

Very common species of the whole Rocky Mountain region, southward (in Colorado) preferring sunny exposures among foothills, but in British America occupying the dry open prairies. Apparently taken by Mr. Rydberg for the real *A. dioica*, to which, however, *A. parvifolia* is far more nearly allied. It has been obtained in Colorado by many collectors. In Utah, at Alta, by M. E. Jones, 1886. Centennial Valley, Wyoming, A. Nelson, 1895, n. 1269. Yellowstone Park, F. H. Burglehaus, 1893. Then along its eastern limits, by Geyer, on dry hills of the Missouri, 1839. Middle Loup River, Rydberg, 1883, n. 1292, and by the same near Lead City, South Dakota, 1892, n. 793. Farther to the westward, by R. S. Williams, at Columbia Falls, Montana, 1894; and in the Canadian Survey collection as follows. Open prairies, Brandon, Manitoba, by Macoun, 1896, n. 12439. Prairies of White Mud River, Assiniboia, by the

same, 1895, n. 10908. Dry gravelly slopes, Pheasant Mountain, Northwest Territory, 1879, n. 11271. Dry slopes, Spence's Bridge, B. C., 1889, n. 11270, in part.

This is another one of those common and widely dispersed species of which I have seen no male plant.

A. NITIDA. Low, slender, loosely cæspitose by short assurgent leafy stolons, the leaves of these little more than ½ inch long, cuneate-spatulate, obtuse, lustrous-silvery on both faces and viscidulous: stem 2 or 3 inches high, somewhat woolly, as also the short erect leaves: heads subsessile and glomerate: involucre scarcely woolly, some of the outer bracts ligulate, wholly chartaceous and greenish, the others with ample white tips, those of the outer being narrow, the inner successively broader and obovate: bristles of the pappus (the male only) with narrow terminal dilatation and this laciniate below, serrulate above.

Dry ground on Charlton Island, James' Bay, Mr. Jas. M. Macoun, 8 July, 1887, n. 11272. A peculiar species both as to floral characters and in the indument of the mature leaves, this being as it were conglutinated into a firm shining silvery coat of which the individual hairs are scarcely resolvable by the strongest hand lens. Only the male plant was collected.

A. AIZOIDES. Very loosely cæspitose, the branches rigid, stout, ascending, scarcely stolon-like, the leaves forming a rosette at summit, these thick and firm in texture, spatulate from a broad rounded and obtuse terminal portion, permanently silvery-white on both sides with a dense tomentum, not in the least viscid: peduncles an inch high, linear-bracted, bearing at summit about 3 small sessile heads; scarious tips of the involucral bracts dull-brownish, those of the outer ovate, of the inner obovate: pappus-bristles (only the male known) apparently oblanceolate from toward the base, serrulate.

Dry barren ground among the Cypress Hills, Northwest Territory, John Macoun, 1883, n. 11245. Remarkably distinct from all other known species by its rigid fruticulose habit, and rosulate leaves terminating the short branches, the whole strongly suggesting some possible silvery-leaved Sedum.

### ***Tips of involucral bracts brownish or dark-brown.*

#### +– *Leaves glabrate, at least above.*

A. ALPINA, Gærtn. Fr. et Sem. ii: 410, but only as to the name; the description and figure appertaining to the male of *A. dioica*. True *A. alpina* is one of the few species of its genus in which the pappus-bristles of the male flowers are only more strongly barbellate at the apex without being clavellate-dilated. Except under a strong lens the bristles are quite alike to the eye, in female and male specimens. This is the only species to which Linnæus gave (under *Gnaphalium*) a diagnosis, and by that diagnosis it is easy to identify it. It was described from Lapland specimens; is common in the mountains of Norway and of Greenland, but is not known to occur on the North American continent, unless perhaps a sheet of specimens (n. 11239) in Canadian Survey collection, said to have been obtained on the Arctic sea coast by Dr. Richardson, may represent it.

A. ANGUSTATA. Low and tufted, the offsets very short and suberect, scarcely stolon-like, densely leafy: leaves ¾ inch long, very narrowly spatulate, acute (cuspidately mucronate under a lens), glabrate above: stems 1½ to 3 inches high, notably leafy, the leaves nearly approaching those of the offsets in size and form: heads large, mostly solitary and campanulate, rarely 2 or 3: outer bracts of the involucre oblong-lanceolate, the inner lanceolate, all acuminate, of a dark greenish brown.

Known only from coasts of Hudson's Strait, where it was

collected in August, 1884, by R. Bell, the specimens being in the Canadian Survey collection, on sheet n. 11248.

A. GLABRATA. *A. alpina*, var. *glabrata*, J. Vahl in Fl. Danica, xlvii, t. 2786, fig. 4. Dwarf and tufted, the offsets short and suberect, the whole plant glabrous even from the first, except an obscure somewhat glandular pubescence on the pedicels and outer bracts of involucre: leaves narrowly spatulate-linear or oblanceolate, acute, $\frac{1}{2}$ to $\frac{3}{4}$ inch long: stems very slender, either monocephalous, or with 2 or 3 heads on distinct and almost filiform pedicels: bracts of the involucre oblong-lanceolate, acute, dark-colored as in *A. alpina*.

Dry rocky places among grasses, in northern Greenland, 21 July, 1886, Theodor Holm. The only known species that is destitute of woolliness or tomentum.

A. LABRADORICA, Nutt. Trans. Am. Phil. Soc. vii. 406. More than thrice the size of *A. alpina*, the slender stems 8 or 10 inches high, but the leaves not at all larger than in that species, much more broadly dilated at summit, well rounded and cuspidate-mucronate, very bright green and glabrous above from the first: heads usually 2 or 3, all on filiform pedicels $\frac{1}{2}$ to 1 inch long, the lateral twice the length of the terminal one.

Certainly very distinct from *A. alpina*, and perhaps rare or local. Two specimens are in the Canadian Survey collection, from Stillwater, Labrador, obtained in 1896.

A. MONOCEPHALA, DC. The characters of this far-northern and insular species are better given by Lessing in *Linnæa*, vi. 221, than by De Candolle. The last-named author does, indeed, mention that the leaves have indument on the lower face only; yet Lessing's referring the plant to *A. alpina* implies that character. It seems never to have been recognized by either of the two celebrated botanists

named that Gærtner mistook the male *A. dioica* for Linnæus' *Gnaphalium alpinum.* I have seen no male individuals of *A. monocephala.*

Mr. James M. Macoun collected the species at its original station, Unalaska Island, in 1891; and it is not yet known from any other locality.

### +– +– *Leaves permanently woolly on both faces.*

A. UMBRINELLA, Rydb. When the author of this excellent specific proposition compares the species with *A. alpina,* he says that "the staminate plants of the two are almost identical in every respect, except that the bracts are of slightly lighter color in *A. umbrinella.*" I cannot but infer from this that Mr. Rydberg had failed to settle for himself the identity of *A. alpina.* The two differ very widely as to certain vegetative characters; *A. umbrinella* exhibiting slender dry and wiry stolons, and wearing the whole aspect of those plants which have an arid habitat. Its foliage is much broader in proportion to its length, and is densely and permanently tomentose on both faces; and the pappus in the male is as strongly clavellate here as in *A. dioica* itself.

The Rocky Mountains of Wyoming and Montana seem to be the center of distribution for the species. I find little of it in the collection of the Canadian Survey. Two specimens (on sheet 11242), both male, from Spence's Bridge, B. C., I refer here, although they have a looser inflorescence than is seen in any more southeasterly specimens; also sheet 11267, from dry mountain pastures, Kicking Horse Lake, B. C., seems to be a larger looser form of the same, the specimens female.

A. MEDIA. I am constrained to thus designate as a subspecies or species all that has passed for Pacific N. American *A. alpina.* Doubtless Mr. Rydberg, in segregating *A. um-*

*brinella*, took the present plant for the real *A. alpina*, or at least as representing, in some way, that species. It is distinguished from *A. umbrinella* chiefly by its smaller size, more herbaceous texture, and larger heads, with narrower thinner darker-colored bracts. From *A. alpina*, on the other hand, it is entirely foreign in view of the distinctly dilated pappus-bristles of the male flowers. They are narrower, indeed, at the tip, than those of *A. umbrinella*, yet Old World and genuine *A. alpina* never displays any kind of an approach to this sort of pappus; and its involucral bracts are also decidedly narrower and more acuminate than in this, its West American homologue.

*A. media* is common on the eastern slope of the Sierra Nevada in northern and middle California, thence northward to Oregon, Washington, and British Columbia. Good herbarium specimens have been distributed by Mr. Sonne, from mountains above Coldstream, Placer Co., California, and from Mt. Hood, Oregon, by Mr. Howell. In the Canadian Survey collection the following sheets exemplify the species: n. 11242 (in part), from crevices of rocks, alt. 6000 ft., on mountains north of Griffin Lake, B. C.; n. 11243, summit of Mt. Arrowsmith, Vancouver Island, on dry slopes; n. 11246, on mountain slopes, Bow River Pass, B. C., all by John Macoun.

A. PULVINATA. Dwarfish but rather stout, the ascending or decumbent notably leafy flowering stems 2 to 4 inches high, arising from a compact cushion-like mass of short rosulate-leafy offsets; the leaves of the latter mostly less than $\frac{1}{2}$ inch long, obovate or spatulate-obovate, very white on both faces with permanent tomentum: leaves of the stem longer than the others, oblong or spatulate-oblong, acute: heads very large for the plant, usually 6 or 8 in a dense glomerate cluster: bracts of the involucre rather light-brown (but darker than in *A. umbrinella*), of the female plant lanceolate, acute, of the male oval, obtuse: bristles of

the pappus in the male not in the least clavellate at tip, though somewhat thicker and more barbellate above the middle.

A remarkably distinct species by its vegetative characters, the cæspitose portion, with its broad rounded white-woolly closely compacted leaves, resembling some pulvinate-cæspitosen *Eriogonum;* but in floral character the plant is more nearly allied to *A. alpina* than are some which bear a greater superficial resemblance to it. *A. pulvinata* is known only in the Canadian Survey collection, from the far Northwest, where it has been several times obtained by Mr. John Macoun, whose specimens bear the following numbers: 18491, 18493, 18495 and 18498, all from Alberta; and from Kicking Horse Lake, 1890, by the same.

A. EXILIS. Smallest of species and strictly monocephalous; stems of male plant ½ to 1 inch high, of female 2 or 3 inches, all very slender; stolons equally so, and none much exceeding ½ inch in length, moderately leafy, the leaves spatulate, acute, of thinnish texture and permanently white-woolly on both faces: involucres campanulate, the thin brown scarious tips of the bracts ovate-lanceolate or lanceolate and acute or acuminate in the female, much darker and from round-obovate, and very obtuse, to ovate and acutish in the male: pappus-bristles in the male very distinctly clavellate-dilated at summit, and the dilated portion not serrulate, but almost entire.

Known only from St. Paul Island, Behring Sea, where it was collected in 1887, the male plants by Mr. James Macoun, 2 July, the female by Mr. Trevor Kincaid, 15 August. Thoroughly distinct from *A. monocephala* not only by the permanency of the white indument, but in the character of the indument itself, this being very fine, close, and silky in the older species, and loose and woolly in the new one.

A. LANATA. *A. carpathica*, var. *lanata*, Hook. Fl. i. 329. I am still without evidence that true *A. carpathica* exists in

North America. In that species the leaves are green and glabrate above, and its involucre is very unlike that of our plant, its bracts being much broader, shorter and less pointed. The radical leaves in *A. lanata*, as compared with those of *A. pulcherrima*, are small and nerveless; the tips of its involucral bracts in the male are broad, obovate, and very obtuse, while in the female the herbaceous body of the bract is greatly narrowed and elongated, and with a narrow white tip. *A. pulcherrima* inhabits low boggy places, at least in the far North, while *A. lanata* is of more elevated and comparatively dry slopes. It is in the Canadian Survey Collection under the following numbers: 11253, from grassy slopes at 6000 ft. altitude in British Columbia, and mountains north of Griffin Lake, in the same region; 11251, from mountains at Warm Springs, Kootanie Lake, these by John Macoun. Also n. 11255, from summit of Kootanie Pass, in rather sterile soil, collected by Dawson; and again, n. 11250, from alpine slopes at 7000 ft. near Kicking Horse Lake, John Macoun.

### 3. *Some southwestern species of* ANTENNARIA.

The study of the northern species has led, incidentally, to a careful examination of the few southwestern representatives of this genus, with the following results.

A. ROSULATA (Rydb.?). Depressed-cæspitose, the numerous rather coarse and subligneous branches forming a broad mat covered with many short densely leafy stolons: leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch long, from spatulate-obovate to obovate-lanceolate, acutish, silvery white with long appressed pubescence: heads 1 to 3, on peduncles only $\frac{1}{4}$ to $\frac{1}{2}$ inch long: involucral bracts in the male plant mostly lanceolate and subcoriaceous throughout, or only the acutish tips scarious; those of the male with larger obovate obtuse or retuse and nearly as long

as the body: pappus-bristles in the male somewhat spatulately and not widely dilated at summit.

Mr. Rydberg has defined no species to which he would apply the above name. The equivalent which he cites, the *A. dioica* var. *congesta* of Gray, is an aggregate, made up of at least two very different things, an alpine plant of Colorado, and another belonging to the hot dry desert regions of the far Southwest. But Mr. Rydberg, while taking the name *rosulata* from Gray's partial characterization of the alpine one, cites, as herbarium types of his species, the other. Had he described either one, we should not have been in doubt as to which should bear the name. I apply it to the plant of Arizona, which is here for the first time described. The best dried representation of it which I have seen is in the U. S. Herbarium, from near Belmont, Arizona, collected by Mr. Toumey in 1892. In the field I was formerly familiar with it.

A. RECURVA. Stout and low, apparently not cæspitose; the few stolons extremely short, but bearing a dense tuft of rather large leaves, these an inch long or more, narrowly spatulate, acute, somewhat closely conduplicate and falciform-recurved, hoary-tomentose, and permanently so on both sides: heads 3 to 6, sessile and glomerate at summit of the stem, this 1 inch high or more: bracts of the involucre (female only) with elliptic-oblong acutish milk-white tips.

Known only from the vicinity of Flagstaff, northern Arizona, and in female individuals only.

A. MARGINATA. Low, cæspitose, the stolons short: leaves spatulate or oblanceolate, obtuse, mucronate, the mucro deciduous, upper surface green and glabrous at least in age, but the dense white tomentum of the lower face usually showing as a narrow white margin to the leaf as seen from above: stems 2 inches high or more, leafy-bracted: involucre not very woolly, the tips of its bracts in the female plant from oblong-obovate and obtuse in the outer series, to

narrow and acutish in the inner, those of the male heads purplish at base, but mainly white, broadly and somewhat rhomboidly obovate, acute: pappus-bristles in the male dilated at summit and acute.

A New-Mexican species, but only sparingly, and apparently not at all recently collected. I have seen it only in the U. S. Herbarium, where it exists under Fendler's numbers 521[a] and 523, and also in the Mexican Boundary Survey collection, under n. 655.

## 4. *A New Genus of the Senecionideæ.*

### RAINIERA.

Stoutish upright milky-juiced perennial, with the aspect and inflorescence of a *Nabalus*, but more nearly the characters of *Mesadenia*. Heads racemose, 2 or 3 in the axil of each small bract. Involucre simple, cylindric, of 4 to 6 firm erect bracts. Receptacle flat, naked, bearing 4 to 6 tubular flowers; these with narrow cylindric proper tube rather shorter than the combined narrow throat and long linear segments. Achenes prismatic, glabrous, surmounted by a rather coarse pappus of firm sordid or brownish bristles which are smooth except at the slightly thickened and scabrous apex.

R. STRICTA. *Prenanthes stricta*, Greene, Pitt. ii. 21 (1889). *Luina Piperi*, Robinson, Bot. Gaz. xvi. 43, t. 6 (1891). *Psacalium strictum*, Greene, Pitt. ii., 228 (1892). Type more related to the Atlantic North American genus *Mesadenia* (which also is now known to have a milky juice) than to any other; but very distinct from it in characters of involucre, receptacle, achenes and pappus.

## 5. *Some Western Species of* ERIGERON.

ERIGERON CORYMBOSUS, Nutt. Trans. Am. Phil. Soc. vii. 308. The specimens labelled by this name in the various

herbaria form an aggregate which I should long since have attempted to resolve but for a feeling of uncertainty as to which should be considered as representing the type of the species. It is not improbable that Nuttall himself distributed more than one species under this name. The Nuttallian specimen known to Asa Gray was found by him not in harmony with the published character; and the one examined by me at the British Museum does not well answer the description. However, the form well known now as inhabiting the region traversed by Nuttall is the only one of the entire aggregate which has the rough pubescence and the blue rays named by him as essential characters; and this is ordinarily twice or thrice as large as Nuttall allowed; though it is well known, by all who have seen many of his types, that he always chose small specimens, if not even mere fragments, of the larger species. What I take to be the real *E. corymbosus* is commonly much more than a foot in height, and is well represented in Mr. Heller's n. 3377; Mr. Leiberg's n. 643, and Mr. Cusick's n. 1822, all from along the line of Nuttall's travels; while Mr. Suksdorf's n. 670, much smaller, is quite at agreement with the original description, even as to the small dimensions, yet is the same thing, specifically, and from the same general region. The coarse rough spreading pubescence, hispid involucres, and narrow blue rays, are easy marks by which to separate it from the following.

E. PLANTAGINEUS. Stems clustered on rather slender hard somewhat tortuous roots or rootstocks, mostly 6 to 10 inches high, little surpassing the radical leaves, and themselves rather foliaceous with much reduced leaves: herbage with a sparse fine wholly appressed pubescence: lowest leaves 4 to 4 inches long including the slender petiole, the black narrowly lanceolate, acute or obtuse, very conspicuously 3-nerved throughout, entire: heads solitary, or several and subcorymbose: involucres hemispherical, 4 or 8

lines broad, the biserial bracts equal, merely pubescent, not hispid; rays about 40, white, rather broad, 4 or 5 lines long.

In open pine woods of Modoc Co., California, collected by Mrs. R. M. Austin, Mr. M. S. Baker and others. Remarkable for the comparatively large and strongly 3-nerved leaves, which suggest those of *Plantago lanceolata*.

E. ROBERTIANUS. Roots as in the last, and general mode of growth the same; but stems only 4 to 6 inches high, strictly monocephalous; herbage subcinereous with a denser less appressed pubescence: leaves oblanceolate, obtuse, obscurely 3-nerved, the cauline linear, sessile: heads on naked peduncles of an inch or more; involucres broad-campanulate, their few and equal bracts slenderly acuminate, rather densely almost villous: rays 25 or 30, rather broad, white.

Known only from Roberts' Ranch, southeastern Oregon, where it was collected by Mrs. R. M. Austin, in 1893.

E. MICROLONCHUS. Slenderly fusiform perennial root bearing at the crown a central tuft of leaves encircled by several slender decumbent flowering stems 6 to 10 inches high; herbage subcinereous with a fine appressed pubescence of straight hairs: basal leaves 3 to 5 inches long including the short petiole, linear-lanceolate, acute at both ends, entire, 3-nerved: stems with few and rather remote sessile linear-lanceolate leaves: heads commonly solitary, rarely 2 or 3, on slender naked peduncles; bracts of the rather small involucre subequal, hispid at the very base: rays 30 or more, rather narrow, purplish: achenes sparsely strigose-hispid; bristles of the pappus fine and fragile, subtended by an obscure short setiform outer series.

Common on grassy plains and hills of southern Wyoming; collected by the writer plentifully in meadows of Dale Creek in June, 1896, and in various places by Prof. A. Nelson, and catalogued by him as *E. corymbosus*, being his n. 234 from

Telephone Cañon, and first distributed by him as *E. decumbens.* It is a neat species, most related to *E. plantagineus* and *Robertianus.*

E. NELSONII. Tufted stems 6 to 10 inches high, stout, ascending, striate; the short pubescence rigid and spreading but not coarse; linear-lanceolate radical leaves 2 or 3 inches long, entire, 3-nerved; the cauline rather numerous up to the short peduncles, linear, acute, 1-nerved: heads 3 to 6, on short stout peduncles and corymbose, or the stem rarely monocephalous; involucre broad-campanulate, its bracts rather short and merely acute, pubescent but not hispid, rather notably unequal: rays 35 or more, rather broad, purplish: pappus in a single series, but several short acute less scabrous bristles interspersed among the ordinary long ones.

Wyoming and Montana; the n. 859 of Prof. Nelson's Wyoming plants, under *E. corymbosus* being typical. Except in the monocephalous state (in which it resembles *E. canus*) rather better meriting the name *corymbosus* than does the genuine thing; but very distinct from all others of this group by its stouter and more rigid habit, and the inequality of the bracts of the involucre which give to this a somewhat imbricated appearance.

E. MEMBRANACEUS. Near *E. salsuginosus*, and as large as the larger states of that species, but more slender and with ampler foliage, the leaves relatively broader, glabrous except along the margins, the whole texture very thin, and of a dark green: lowest leaves 6 inches long, the oblong-lanceolate blade longer than the petiole; the cauline 2 to 4 inches, ovate-lanceolate or ovate, broad and spreading: heads about 3, on slender erect peduncles, and thus approximate, not divergent: bracts of the involucre viscidulous, acuminate: rays about 30, bright blue, $\frac{1}{2}$ inch long or more.

Eastern Oregon, at 5000 to 6000 feet in the mountains, W. C. Cusick (n. 1771). A very interesting, yet troublesome plant, intermediate, as it were, between *E. salsuginosus* and *Aster Cusickii*, and with far more likeness to *Aster* than to *Erigeron*.

E. EXIMIUS. Stems mostly several from a small branching crown or caudex, slender but rather rigid, 10 to 16 inches high, with few and scattered leaves; herbage glabrous and glaucescent, except that the leaf-margins are sparsely hirsute-ciliate and the upper part of the stem and the peduncles rather densely granular-glandular, and with a few short spreading hairs: all the leaves perfectly entire, the tufted basal ones with spatulate-oblong obtuse blade and slender petiole; the cauline from oblanceolate to spatulate and lanceolate, the middle and uppermost sessile: heads 4 to 9 (rarely 1 or 2), on slender rigid naked peduncles: bracts of the large involucre few and broad (only about 20), lanceolate, viscid-granular throughout, and only the very base hirsute: rays numerous and narrow, ½ inch long or more, lilac-purple to rose-purple, rarely white.

Species abundant in pine woods below Marshall Pass, Colorado, and particularly on the lower slopes of Little Ouray Mountain in the same region, in rather dry ground; the allied, yet very different, *E. Coulteri* being as common in more moist and shady situations in the same district.

E. DRUMMONDII. *E. glabellus*, var. *pubescens*, Hook. Fl. ii. 19. Size of *E. glabellus*, but stems apparently solitary rather than clustered, and strictly erect, the whole plant somewhat cinereous with a roughish hirsutulous pubescence, this spreading or even retrorse on the striate stem, but somewhat appressed on the foliage: leaves from broadly to narrowly oblanceolate, all very acute, mostly with a few salient serratures: heads 1 to 4, large, with numerous and narrow long rich purple rays; the involucre hemispherical, not more pubescent than other parts of the plant.

Apparently common in the Rocky Mountain region of British America, in Alberta and adjacent British Columbia; well represented in Mr. Macoun's n. 10848, from Milk River Ridge; also Canby, n. 140 (1897) from near Banff; first collected by Drummond.

### 6. *Miscellaneous New Species.*

CHRYSOPSIS FASTIGIATA. Stems several from a perennial root, ascending, a foot high, rigid and brittle, densely clothed with small ascending or suberect leaves, these mostly less than an inch long, linear-spatulate to spatulate oblong, acute, sessile, white on both faces with a dense silky tomentum; heads numerous and narrow, in rather naked fastigiate corymbs at the ends of all the branches; bracts of the narrow turbinate involucre rather softly strigose-pubescent: rays few, short and inconspicuous, light-yellow: achenes silky-villous; no trace of outer squamellate pappus.

San Bernardino Mountains, California, at 10000 to 15000 feet, S. B. Parish, 1895; the specimens distributed for *C. echioides*, to which it bears no resemblance; even belonging to the *Ammodia* section.

CHRYSOPSIS HIRSUTA. Low, slender, the tufted and leafy stems only 6 or 8 inches high, very leafy and the leaves ascending, spatulately oblanceolate, acute, green and granular-glandular beneath a sparse rather stiffly hirsute pubescence, the leafy bracts subtending the 2 or 3 subsessile heads hirsute-ciliate, as are also the small outer bracts of the turbinate involucre, the others merely granular-viscidulous: rays very few (about 5 to 8), deep yellow: pappus with an outer series of short very narrow paleæ.

Banks of Hangman Creek, near Spokane, Washington, C. V. Piper, 3 Sept., 1896. Plant with much the appearance of the *Ammodia* section of the genus.

GRINDELIA MACROPHYLLA. Stout erect herbaceous, 3 feet high, corymbosely branched at summit, wholly glabrous, or with a few scattered short hairs on the pedunculiform branches: leaves thinnish, the radical a foot long or more, lanceolate, scarcely petiolate, incisely serrate; the cauline oblong or spatulate-oblong, 2 to 4 inches long, sessile and clasping by a broad base, coarsely serrate, or the uppermost reduced and entire: involucres large, hemispherical, scarcely glutinous, their narrow bracts with a long slender spreading acumination: rays many, an inch long or more.

Large and handsome species, obtained by the writer along the margins of a tide-water swamp near Vancouver, British Columbia, in July, 1890.

GRINDELIA SUBALPINA. Low perennial, the stoutish corymbose-panicled stems seldom a foot high, only sparingly leafy except at base; lowest leaves oblanceolate, petiolate, acute, coarsely and remotely incised, usually scabrous-puberulent; the few cauline oblong-spatulate, rather remotely and sharply serrate, glabrous: depressed globose heads rather large; bracts of the involucre numerous, with filiform squarrose-spreading tips, the whole very glutinous: rays numerous, narrow: bristles of the pappus 2 to 4, slender, barbellulate.

High plains of southern Wyoming, and at subalpine elevations on the mountains of northern Colorado. Hitherto confused with *G. squarrosa*, which is wholly of the plains, strictly biennial, branching and very leafy, perfectly glabrous, and with stouter smooth pappus-bristles.

GRINDELIA PLATYLEPIS. Probably perennial, stouter and taller than the last, glabrous throughout, not at all glutinous: heads rather small; involucre almost hemispherical, usually closely subtended by one or more large leafy bracts, its proper bracts or scales ovate or oblong, abruptly herba-

ceous-tipped, not in the least resiniferous or glutinous: rays broad, oblong, obtuse, not toothed at apex: pappus-bristles subulate-aristiform, very acute, barbellulate.

Vicinity of Laramie, Wyoming, and at Sherman, therefore also a subalpine species; and very distinct from all others by its low involucre of few and broad bracts. No other recognized species of *Grindelia*, except *G. latifolia* of southern California, is destitute of that gumminess so generally characteristic of the genus.

SENECIO BERNARDINUS. Tufted perennial ½ to 1 foot high, with hoary-tomentose herbage: the crowded leaves of the short caudex subcoriaceous, persistent through the winter, glabrate, of round-obovate outline, seldom ½ inch long, on slender petioles of more than an inch; lower cauline cuneate-obovate, the upper spatulate, all with a few coarse teeth at least at the obtuse apex: heads nearly ½ inch high, 3 to 7 in a corymb; involucre nearly cylindrical, its 12 to 15 rather broad lanceolate bracts floccose-tomentose: rays rather ample and showy, yellow.

At an altitude of 6500 feet on the San Bernardino Mountains, southern California, S. B. Parish; always distributed as *S. Neo-Mexicanus*.

SENECIO CONDENSATUS. Stems solitary, stout and low, very leafy, 4 to 6 inches or rarely almost a foot high; herbage somewhat succulent, sparsely flocculent when young: lower leaves almost as long as the stem, spatulate-obovate, the upper oblanceolate, all obtuse, crenately or more sharply dentate: heads 3 to 6, more than ½ inch high, closely sessile in a large cluster among the upper leaves: bracts of the decidedly flocculent involucre lanceolate, acuminate; rays either wanting or few and deep yellow.

High ridges of the Blue Mountains, Walla Walla Co., Washington, 15 July, 1896. C. V. Piper.

# Some Western Polemoniaceæ.

That far-western Polemoniaceous type, common to North and South America, which has figured variously with different authors as *Gilia gracilis*, *Collomia gracilis* and *Phlox gracilis*, having been the subject of special investigation on my part for many years, is now perceived to be an aggregate of several well differentiated species; and, in the study of the proposed segregates I have been obliged to reconsider the proposition which I made some eleven years since, that the type is congeneric with *Phlox Drummondii*.[1]

At the time to which I refer, it was a principle at least tacitly agreed to, in the classification of the Polemoniaceæ, that whether seeds developed mucilage when wetted or not, need not be considered; though *Phlox* alone had been characterized by Asa Gray as with seeds unaltered when moistened, and *Collomia* alone as uniformly exhibiting mucilaginous-coated seeds. But in other natural groups, such as *Gilia*, *Navarretia* and *Linanthus*, it was conceded that some species had mucilaginous seeds, others seeds unaltered under moisture. I had, therefore, no scruple against transferring *Collomia gracilis* to *Phlox* on this score. If species could be admitted into *Gilia* and into *Navarretia*, some with and some without the gummy seed-coat, the same elasticity of character as to seeds might logically be conceded to *Phlox*. At present I am disposed to adopt it as a principle that species with mucilaginous seeds are nowhere, in this family, to be placed as congeneric with such as have seeds devoid of the gummiferous coating. This implies the removal of my *Phlox gracilis* from the genus *Phlox*. This was referred by Douglas, its discoverer, to

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[1] Pittonia, i. 141 (1887).

*Collomia;* but it is totally foreign to that genus by its calyx, capsule and seeds. From *Gilia* its few and large mucilaginous-coated seeds, its opposite leaves, its strictly salverform corolla, and unequally inserted stamens exclude it. It cannot be consistently treated as other than a generic type; and I propose in this view of the case to name it

## MICROSTERIS.

Small much branched annuals, with entire leaves, all except the floral ones opposite. Flowers minute, scattered, singly or in pairs in the axils of the rameal alternate leaves. Calyx, corolla, stamens and capsule wholly as in *Phlox.* Seeds few, large, the coat when moistened developing a thick glutinous mass, this not spirilliferous.

1. M. GRACILIS. *Collomia gracilis,* Dougl. in Hook. Bot. Mag. t. 2924 (1829), and *Gilia gracilis,* Hook. l. c. *Phlox gracilis,* Greene, Pitt. i. 141 (1887). That this, as published by Hooker, was an aggregate, is apparent from the fact that, in the *Flora Boreali-Americana,* he prints as synonyms of this, two species which Douglas had segregated and named in manuscript.[1] In other words, Douglas had made out three species, which Hooker, in publishing, merged in one; merely printing the other two names as synonyms. The figure in the *Botanical Magazine* appears to represent altogether only one of Douglas' three, and this must be accepted as the type of the species. This type came from the Spokane River region, and is beautifully represented in several herbaria by specimens which Mr. Leiberg distributed in 1891, from Lake Pend d'Oreille, under n. 119. Heller's n. 3278 is also the same. Mr. Leiberg has also collected in the same region a second species, the distinctness of which he has insisted upon. I have no doubt that this is one of Douglas' segregates, and I take up the name which he assigned it.

[1] See Hook. Fl. ii. 76.

2. M. HUMILIS. *Collomia humilis*, Dougl. in Hook. Fl. ii. 76, probably. The mere name *humilis* may, in this case, be considered sufficiently diagnostic; for, in the region whence these were derived *M. gracilis* is a tall plant, commonly 10 or 12 inches high, and not widely branching, while this other is low, branched from the very base, and that so diffusely, that the plant as a whole is broader than high, the height seldom one-third that of *M. gracilis*. The same glandular pubescence marks this and *M. gracilis* alike; but the calyx is shorter, and the capsule less elongated, even almost globose, in *M. humilis;* while a still more notable difference between the two lies in relative length of pedicels in the geminate flowers. In *M. gracilis* the longer pedicel is of barely twice the length of the short one, reaching only as high as the middle of the calyx of the subsessile flower. In *M. humilis* the long pedicel is four or five times longer than the short one, bearing its calyx conspicuously above the tips of the segments of the subsessile calyx. Mr. Leiberg records the fact that where these two species grow together, on gravelly hills, at the south end of Lake Pend d'Oreille, this small species is in flower two weeks earlier than the other. Mr. Piper has sent me what appears to be good *M. humilis* from Spokane (n. 2291), and also from the Palouse Hills, near Pullman (n. 1518), both under the name of "*Gilia aristella*, Gray," an error which seems to intimate the impossibility that a careful field botanist should confuse *M. humilis* and *M. gracilis*.

3. M. GLABELLA. Near *M. humilis*, but smaller, more slender, less branching, the geminate pedicels quite as unequal, the herbage totally destitute of glandular pubescence and glabrous except some scattered ciliate hairs at the base of some of the leaves and some short white pubescence on the branches: calyx glabrous and glandless, the subulate-linear teeth shorter than the tube: corolla very small, red, the tube (white) well exserted.

This is known to me only by specimens from Falcon Valley, Washington, distributed by Mr. Suksdorf as *Gilia gracilis*, var. *glabella*. It should, if a mere variety, be referred to *M. humilis;* but the extreme difference between that and this in the matter of pubescence alone, would establish it as a species, in default of intermediate forms.

4. M. STRICTA. Stout, erect, a foot high, the stem simple and very leafy up to the merely cymose floriferous summit; only the upper part of the stem, the inflorescence and floral leaves pubescent with gland-tipped hairs, the main stem, at least below the middle, and its foliage, glabrous: lowest leaves spatulate, obtuse, the lower and middle cauline all opposite, linear-lanceolate, acute, suberect or at least ascending, 1 to 1½ inches long, surpassing the internodes: inflorescence very leafy: flowers all geminate, the longer pedicel only about twice or thrice the length of the other: corolla red, its tube not in the least exserted, the whole corolla even a little surpassed by the calyx-segments; fruiting calyx ½ inch long, its teeth rather longer than the tube: capsule large, subglobose.

Northeastern California, and adjacent Oregon.

5. M. CALIFORNICA. Slender, 6 to 10 inches high, loosely and somewhat dichotomously branched from the middle: leaves from obovate-spatulate in the lowest to oblong and oblong-lanceolate, ½ to ¾ inch long, all more or less pubescent with scattered short hairs, a few fine gland-tipped hairs on the flowering branches and calyx: flowers mostly solitary, but when geminate the long pedicel exceeding the whole length of the subsessile flower: calyx-teeth rather shorter than the tube: corolla wholly red, the limb ampler than in other species, its lobes emarginate, the whole little surpassing the calyx: capsule ovoid.

Common in the Coast Range of middle and northern California, thence eastward to the western base of the Sierra

Nevada; very distinct from the far northern species by its larger wholly red corolla with emarginate, or somewhat obcordate lobes.

6. M. MICRANTHA. *Collomia micrantha*, Kell. Proc. Calif. Acad. iii. 18 (1863). Dwarf, usually only 2 or 3 inches high and with but 2 or 3 pairs of properly cauline leaves, these from round-ovate to oblong, obtuse, hispid-ciliolate on the margin, and with similar hairs scattered over the surface of the leaves and clothing the stem, this and the inflorescence bearing also the usual finer gland-tipped hairs: inflorescence compact (the plant in fruit as broad as high): flowers all geminate, and the pedicels not very unequal: calyx-teeth pungently acute, scarcely half the length of the tube: the minute corolla well exserted, the limb pale purplish, the tube white: capsule elongated-oval.

Of the desert regions of eastern California and western Nevada, extending southward to northern Arizona; perhaps also including the still more dwarf white-flowered plant of Wyoming, Colorado and New Mexico; though this, for geographical reasons may be expected to prove distinct.

7. M. ANDICOLA. *Collomia gracilis*, var. *andicola*, Benth. in DC. Prodr. ix. 308. Described as perfectly glabrous throughout, and with subspathulate calyx-segments; by which characters alone one must accept it as altogether distinct from all the North American species. It is attributed to the Andes of Chile, and Cuming's n. 157 and Bridges' n. 537 are cited by Bentham as types.

## GYMNOSTERIS.

Diminutive annuals devoid of proper foliage, the base of the stem showing even in maturity a turbinate or campanulate sheath composed of the united and persistent cotyledons; the capitate-congested inflorescence subtended by an

involucre of 4 or 5 leaves which are distinct and herbaceous above, but scarious and united at base. Calyx vesicular and urceolate, thin-scarious, only the unequal teeth herbaceous. Corolla salverform, with long and slender tube; the somewhat dilated throat bearing the stamens, the whole marcescent-persistent, the dilated base of the tube still investing the thin apparently indehiscent capsule with its ripe seeds. Seeds many, obliquely somewhat cubical, the angles membranaceously margined or winged; testa thin, mucilaginous when wetted, but not developing spiracles.

A most distinct genus, as to vegetative and floral characters; one of its most remarkable peculiarities being the almost wholly connate cotyledons; a character not before pointed out. The fact that the leaves of the involucre are united at base has also hitherto been overlooked.

G. NUDICAULIS. *Collomia nudicaulis*, Hook. & Arn. Bot. Beech. 368. *Gilia nudicaulis*, Gray, Proc. Am. Acad. viii. 266, in part. Very small and slender, the single filiform stem seldom 2 inches high: the involucre 4-parted almost to the base and the segments lanceolate: flowers very small and inconspicuous.

Plains of the northern interior from eastern Oregon to northern Utah and Colorado.

G. PULCHELLA. Much stouter than the preceding, but little taller, a pair of lateral branches commonly arising, with the main stem, from the axils of the cotyledons, and floriferous at summit: involucre 5-cleft and less deeply so, the segments ovate-lanceolate: flower clusters large and showy, the filiform corolla-tube nearly $\frac{1}{2}$ inch long, and the expanded limb 4 lines wide or more, white or lilac, and in either color marked with a yellow center.

Sandy plains of western Nevada; distributed by Mr. C. F. Sonne, in excellent specimens, from near Steamboat Springs, Washoe County.

I have been shown, by Mr. Coville, specimens of a third member of this genus, collected by himself, if I remember rightly, in Idaho, or eastern Washington. This is intermediate in size between the two better-known species, and remarkable for being constantly, and I believe, somewhat dichotomously branched; the flowers not as large as in *G. pulchella*, yet large enough to be rather showy.

---

POLEMONIUM ELEGANS. Near *P. viscosum*, of the same habit, with similarly crowded small leaflets, but these obovate or spatulate-obovate rather than rounded, even more viscid than *P. viscosum*, the inflorescence more approaching the cymose: calyx narrow—campanulate rather than tubular, cleft to the middle, the segments ovate-oblong, obtuse; the corolla broad-funnelform, the gradually dilated tube yellow outside the calyx and about as long as the obovate blue segments; stamens included.

In volcanic sand at 9000 feet altitude on Mt. Rainier, Washington, Aug., 1895, C. V. Piper; also on Mt. Paddo, Suksdorf. A beautiful species, and, with the next, conjoining two rather different groups.

POLEMONIUM EXIMIUM. Near the preceding, larger, less leafy, the leaflets extremely reduced in size, 3 to 5-parted: inflorescence quite as distinctly branched and capitate-cymulose: calyx more narrowly campanulate, with comparatively shorter rather broadly oblong obtuse lobes: corolla not two-colored but wholly purple, the tube outside the calyx cylindric rather than funnelform; stamens shorter, even included within the tube of the corolla.

I suppose that all the so-called *P. confertum* of the Californian Sierra is of this very distinct species. My specimens are from an altitude of 12,300 feet on Mt. Conness, collected by Harford.

## New or Noteworthy Species.—XXII.

Arabis drepanoloba. Perennial, the several stout decumbent stems 8 to 12 inches high; herbage seemingly glabrous and glaucous, but the small oblanceolate lowest leaves sparsely stellate hairy; the oblong sessile auriculate cauline ones like all the remaining parts of the plant glabrous: corollas red, $\frac{1}{4}$ inch long or more: fruiting raceme 2 to 5 inches long, the broad spreading and slightly falcate-recurved pods 2 inches long including the short pedicel, about $1\frac{1}{2}$ lines wide, abruptly acutish, the stigma sessile; valves with a manifest nerve at base only; seeds in two rows under each valve, flat, obovoid, narrowly winged.

Collected in the National Park, near Banff, Alberta, about Devil's Head Lake, Aug., 1891, by Mr. Macoun, and distributed for *Arabis Lemmoni*, to which it is, indeed, related, yet easily distinguishable by its larger dimensions, much less pubescent lower leaves, and especially by its pods, which are twice as broad, and with two rows of seeds.

Draba præalta. Annual, very erect and strict, mostly quite simple, 10 to 15 inches high, subcinereous throughout, even to the pods, with short stellate hairs: rosulate basal leaves oblong-lanceolate, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, entire, or with two or three pairs of sharp teeth, the two or three cauline similar: flowers white: the loose fruiting raceme often 5 or 6 inches long, the almost lanceolate pods $\frac{1}{2}$ inch long or more, erect on ascending pedicels nearly as long, acute, rather turgid, not contorted, a channel-like depression marking the line of the midvein from its base to near the middle.

Collected near Banff, Alberta, July, 1891, by Mr. Macoun. This is a plant which, by its annual root and large size, would be taken for a relative of *D. nemorosa*, but for its very

strict habit, narrow leaves and white flowers. It was distributed, however, for *D. incana*, var. *borealis*.

VIOLA BAKERI. Caulescent, yellow-flowered, with a close superficial likeness to *A. Nuttallii*, of the same size and same leaf-outline, but with a subligneous branching caudex; the whole plant perfectly glabrous, not at all fleshy, averaging about an inch in length and from oval to oblong-lanceolate, perfectly entire, marked with about 5 almost parallel nerves; petioles very slender, about twice the length of the blades; rather large deep yellow flowers little if at all surpassing the leaves.

In moist ground, in the Bear Valley Mountains, northern California, M. S. Baker, June, 1896.

POLYGALA LONCHOPHYLLA. *P. Senega*, var. *latifolia* in part of authors. Not as tall as *P. Senega*, stem more rigid, fastigiately branched above, and bearing several shorter looser spikes of more conical outline: leaves of firmer texture and more veiny, their outline rhombic-lanceolate, abruptly and sharply acuminate, the margin finely serrulate-ciliolate; flowers smaller than in *P. Senega* and green, the fruits larger.

The above description applies to only that southern plant which has been confused with the northern variety and mere variety of *P. Senega*. Its seeds are not known; and I expect them to furnish further diagnostic characters for a good species. It may also be noted that the ovate sheathing scales investing the lower part of the stem in *P. Senega* are never seen in *P. lonchophylla*.

POLYGALA TORREYI, Don. Syst. i. 360 (1831). This name must take the place of *P. alba*, Nutt. Gen. ii. 87 (1818), there being a *P. alba* of Buchoz (Dict. iii. 38) of as early a date as the year 1770. This earliest *P. alba* is not in the *Kew Index*, the authors not having been able to gain access to this important work of Buchoz.

LUPINUS VOLCANICUS. Tufted low perennial, the simple ascending sparsely leafy stems only 4 to 8 inches high; the whole plant rather copiously hirsute-hairy: petioles slender, mostly about twice the length of the leaves; leaflets 7 to 9, oblong-cuneiform to oblanceolate, of thin texture, obtuse or acute, the largest about 1 inch long: flowers few and scattered in a short raceme, its peduncle not exceeding the leaves: corolla blue, less than $\frac{1}{2}$ inch long, the banner rather small; half the length of the keel consisting of a stout straight beak-like naked dark-purple apex, the lower uncolored and subscarious part ciliolate.

In volcanic sand, at 8,000 feet altitude on Mt. Rainier, Washington, C. V. Piper, August, 1895. Somewhat allied to *L. saxosus*, Howell, but the pubescence, floral characters, and even mode of growth quite different.

SAXIFRAGA RADULINA. Near *S. Virginiensis;* leaves ovate, oval, and ovate-lanceolate, 1 to 2 inches long, somewhat crenately, or often more sharply and saliently dentate, short-petiolate, roughish and subcinereous on both faces with a minute appressed but rather rigid pubescence of short-jointed hairs: scapes 3 to 6 inches high, almost glabrous, ending in a short subpyramidal thyrsus of white flowers: calyx-lobes triangular, obtuse, dark-purplish: petals spatulate, obtuse; filaments stout, terete, about equalling the petals.

Porcupine River, Alaska, collected in 1891, by J. Henry Turner. As to inflorescence near the Old World *S. nivalis*, but foliage wholly characteristic.

VERBENA HANSENI. Stout, erect, 2 or 3 feet high, simple below, repeatedly trichotomous at the leafless summit: leaves oblanceolate and lanceolate, 3 inches long, obtuse or acutish, serrate, and somewhat coarsely and incisely so, from below the middle, the basal part cuneate and entire, strigose-pubescent on both faces, but the stem and also the branches of the cymose panicle minutely puberulent, except on the sharp angles,

these very scabrous: spikes very slender, 1 or 2 inches long, short-peduncled or subsessile, rather dense: subulate bracts closely appressed to the calyx and of less than half its length; corolla minute, scarcely exceeding the calyx, blue: nutlets minute, scarcely $\frac{1}{2}$ line long, oblong, rugulose on the back, the commissure coextensive with the length of the nutlet.

Foothills of the Sierra Nevada, in Amador Co., California, 1889, Geo. Hansen. In habit, and in the very distinctly and amply trichotomous, inflorescence, recalling the South American *V. littoralis*.

VERBENA ROBUSTA. Stout, rigidly erect, 2 or 3 feet high, without branches other than those of the mostly condensed terminal and subterminal inflorescence: leaves about 3 inches long and exceeding the internodes, of somewhat ovate outline but usually with a pair of large lobes below, thence abruptly narrowed to a cuneiformly petiolar base, the blade strongly rugose-veiny and soft-pubescent beneath, greener and scabrous above: spikes sessile, stout and dense, usually crowded, the terminal one of each short branchlet 2 or 3 inches long and subtended by a pair of very short ones: calyx hispidulous: light-blue corolla well exserted: nutlets $\frac{3}{4}$ line long, quadrate-oblong, marked on the back by one or more prominent striæ and many transverse rugosities, the concave commissure coextensive with the body of the nutlet and with a conspicuous margin.

Dry hills about San Francisco Bay, especially near Point Isabel on the eastern shore, and on Point Tiburon; flowering in the middle of the dry season.

GENTIANA ANISOSEPALA. Annual, erect, slender, simple, 5 to 10 inches high, with a few small flowers terminal and in the upper axils: leaves in a few pairs, the lowest obovate, the middle pairs oval, the uppermost cordate-oval, all obtuse, sessile, $\frac{1}{2}$ to more than $\frac{3}{4}$ inch long: the few flowers about 4 lines long; calyx parted almost to the base into 5 nar-

rowly elliptical very acute segments of unequal length, the shortest hardly equalling the tube of the corolla, the longest almost equalling the full length of the corolla; corolla broadly funnelform, the segments shorter than the tube, rather obtuse, almost equalled by the longer setæ of the crown.

Nez Perces Co., Idaho, Heller, July, 1896 (n. 3440).

PENTSTEMON PULCHELLUS. Cæspitose undershrub, with very short crowded sterile leafy branches, and upright flowering stems, the latter only 2 or 3 inches high including the short thyrsoid inflorescence: herbage light green and glabrous throughout: leaves coriaceous, entire, the lowest from ovate to oblanceolate, only $\frac{1}{4}$ to $\frac{3}{4}$ inch long including the slender petiole, those of the stem in about two pairs, oblong or lanceolate-oblong, sessile: flowers numerous, deep blue, compacted in an interrupted thyrsus of about two verticillasters: sepals, obovate, abruptly acute, with thin purple scarious margins: corolla about 4 lines long, with narrow tube and abruptly spreading limb, the throat sparsely hairy.

On alpine summits of the Blue Mountains, Oregon, W. C. Cusick, n. 1720; distributed for a variety of *P. confertus*, from which it cannot fail to be distinguished by its coriaceous leaves and suffrutescent habit.

PENTSTEMON GENICULATUS. More manifestly suffrutescent than the last, the short prostrate ligneous branches only sparingly leafy, the branchlets divaricate: leaves an inch long including the slender petiole, ovate-lanceolate, acute, entire; the whole plant glabrous, except the pubescent calyx and outside of the corolla: flowering stems mostly 3 to 6 inches high, erect, rigid, with about 2 or 3 pairs of sessile or subsessile obovate or ovate-lanceolate leaves: flowers in a single dense subcapitate terminal cluster which is twice as broad as high: sepals elliptic-lanceolate, very acute, viscid-pubescent:

corolla nearly ½ inch long, of a dark lurid purple, narrow, slightly ventricose.

Common on alpine slopes, below retreating snow banks, in wet clayey or gravelly soil, in the Sierra Nevada of California, August to October. It seems to have been referred heretofore to *P. confertus*, and is doubtless allied to it, though of totally different habit, and peculiar habitat.

PTILORIA FILIFOLIA. Perennial, erect and rather strict, 1 or 2 feet high, wholly glabrous and glaucous, the somewhat virgate branches and main portion of stem clothed with long filiform entire leaves, the lowest leaves broader and runcinate toothed: involucres narrow, 5-flowered: achenes columnar, sharply pentagonal, the whole perfectly smooth, as long as the delicate white pappus, this about 15-rayed and plumose to the base.

Gravelly banks of the Yakima River near Clealum, Washington, collected by the writer, 13 Aug., 1889.

PTILORIA SCABRELLA. Perennial and dwarf, the solitary rather stout and widely branched stems only 4 to 6 inches high; herbage glaucous, roughish with scattered sharp muricate points: leaves mostly barely an inch long, linear, sharply runcinate-dentate, scabrous, spreading or deflexed, the uppermost rameal reduced to subulate entire bracts: rather numerous heads a half-inch high, about 5-flowered: achenes unknown; pappus long and copious, dull-white, softly long-plumose from below the middle, the basal portion naked and slightly dilated.

Texas, S. C. Neally, 1888; the specimens distributed for *Stephanomina exigua*, and apparently so referred in Coulter's Botany of Western Texas; but not related to that species.

Vol. III. Part 19.

# PITTONIA.

## A SERIES OF BOTANICAL PAPERS

BY

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*Professor of Botany in the Catholic University of America,*

WASHINGTON, D. C.

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## New or Noteworthy Violets.

V. EMARGINATA, Le Conte. This most interesting violet is now known to me as occurring as far northeastward as the vicinity of New York City, where the uncut and characteristically trigonous leaf-outline appears to predominate. Very recently the species has come to me from, where I did not at all expect it, southern Michigan. Mr. O. A. Farwell obtains it in the neighborhood of Detroit. His specimens are labelled "*V. ovata*," and are the first *V. emarginata* specimens seen by me failing to exhibit the triangular leaf-outline. The leaves are all either exactly cordate-ovate or subsagittate-oblong; but in spite of this new leaf-cut, the plant is unmistakably *V. emarginata*.

Southward and southwestward, even as far as to Louisiana and at least eastern Texas, the species seems to occur in fairly typical condition; though from the mountains of eastern Tennessee we have a deviation from the type so marked as to deserve at least a varietal name. I shall call it var. SUBSINUATA. Its leaves, though of not indistinctly trigonous outline, are all subpinnately and subsinuately deeply toothed or parted, even the small broad early ones are thus almost lobed rather than merely toothed. There are more evident traces of pubescence here than in ordinary *V. emarginata*, and, if in the living plant a different texture of herbage should reveal itself, I should not doubt the specific distinctness of this form; because its peduncles are more slender, apparently not erect, and the flowers are notably larger; while the capsules (from the later apetalous flowers), are remarkably small and short.

The only specimens seen are in the herbarium of my

friend T. H. Kearney, Jr. The autumnal specimens were collected by himself in September, 1897. There are some suggestions of affinity between this and a certain hitherto somewhat obscure southern violet, of which I shall next make mention.

V. ESCULENTA, Ell. Sk. i. 300 (as a synonym under *V. palmata*, var. *heterophylla*): *V. heterophylla*, Muhl. in Le Conte, Ann. Lyc. N. Y. ii. 139 (1828), not of Poir. Encycl. viii. 646 (1811). It is time that renewed attention should be given to the long neglected *V. heterophylla* of Muhlenberg, first fully described by Le Conte in his admirable monograph. It is said to be a plant of wet clayey lowlands in the Carolinas and southward, not occurring at all in the hilly or mountainous districts. Its leaves are said to be considerably diversified, the whole plant glabrous and slightly succulent, and in use as a pot herb by the negro population. Le Conte, who knew the species well, and, as I have said, was the first to fully describe it, left an unpublished beautifully finished and colored figure of it, and this is in my possession. I have been endeavoring to match this figure, in various collections of southern violets; but the only specimen of it hitherto detected by me is one in the herbarium of Dr. Charles Mohr of Mobile. It is an old specimen, collected long ago, in Louisiana, by Carpenter, seems wholly unlike any other plant known to me, and well matches Le Conte's unpublished plate, of what he called *V. heterophylla*, Muhl.

V. CUSPIDATA. Acaulescent, low, at time of petaliferous flowering 3 or 4 inches high: leaves round-cordate, cucullate, crenate-serrate, veiny and rugose, short-hirsute as to the petioles and along the veins beneath, sometimes also on the upper face, and the margins ciliolate: sepals obtuse, ciliolate from the base to the middle: corolla about 8 lines long and 9 in breadth, deep blue, the paired petals broad-obovate, abruptly acutish, the odd one nearly equalling those next to

it, of oblong-obovate outline, fully expanding, the apex almost truncate but cuspidately pointed in the middle.

The above characters are those of the upland plant of the northwestern states, from Wisconsin northward and westward, locally known as *V. cucullata*, or *V. obliqua*. The description has been drawn up from four or five living plants as they have grown and flowered alongside their eastern homologue at the Catholic University, in wild land, and without cultivation, the plants having been transferred hither, last year, from Rock County, Wis. They have presented a very striking contrast to the eastern plant, in the size and color of their flowers; these being only somewhat more than half as large in *V. cuspidata*, and of a deep blue without a tinge of that red-violet that marks the eastern one. The petals are also broader in proportion, the whole flower being thus more rounded and regular in outline, while the cusp of the keel-petal is quite a new character, and constant in all my plants. By its pubescence, and the ciliation of the sepals, *V. cuspidata* betrays the closest affinity to that hairy *V. palmata* segregate, with lobed leaves, which is common in open woodlands at the East.

V. SUBSAGITTATA. Low, and the very short-petioled leaves depressed or ascending, the whole plant at time of petaliferous flowering often only 2 inches high, the herbage more or less sparsely hirsute-pubescent and the sepals ciliate: leaves rather narrowly cordate-ovate and small, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long at vernal flowering, the basal lobes though rounded and deeply toothed, yet nearly meeting and almost closing the sinus: stout pedicels surpassing the leaves, their bractlets situated below the middle and sometimes near the base: corolla very large, deep-violet, often an inch long and 10 or 11 lines wide, the two pairs of petals broad, rounded and slightly obovate in outline, the odd one shorter than the pair next to it and deeply concave, the whole five white at base, the lower three densely white hairy at base, the hairs not clavellate.

I thus propose, for a new subspecies, what is known throughout a great extent of country west of Lake Michigan, as *V. sagittata.* It is common in southern Wisconsin, occupying rather low pasture and meadow lands, quite after the behavior of true *V. sagittata* at the East and South. An excellent flowering specimen, collected by myself near Albion, Wis., just thirty-two years ago, and still in my herbarium, well represents the species; though the description of the flower is here drawn from living plants now blossoming within my reach; for a year ago I had specimens sent me in the living state, which I at once planted in a piece of wild land occupied by *V. sagittata*, where they have flowered beautifully this spring. By the side of true *V. sagittata* this western species appears quite as a dwarf, in all except its corolla, this being about twice as large as that of *V. sagittata.* But the plant has the pubescence of *V. ovata*, to which, by the way, it has been referred, in some of the herbaria, since *V. ovata* came to be generally recognized as a valid species.

True *V. sagittata* seems to reach central Illinois, and even the southern peninsula of Michigan; but I have not seen it from Wisconsin, nor *V. subsagittata* from any point to the southward or eastward of Wisconsin.

V. SUBCORDATA. Caulescent, erect, slender, 6 to 10 inches high, sparingly pubescent with minute stiff hairs, these somewhat appressed on the foliage, but on the petioles retrorse; leaves thin-membranaceous, from deltoid-ovate and $\frac{1}{2}$ inch long in the lowest to subcordate-ovate and 1 or 2 inches long in the upper, all slightly crenate or crenate-dentate, the very slender petioles 1 to 3 inches long; stipules linear-lanceolate, remotely but saliently serrate: flowers blue, very large, $1\frac{1}{2}$ inches broad, the very thick and obtuse straight spur $\frac{1}{4}$ inch long or more.

A very beautiful species, collected at Esquimault, Vancouver Island, 6 June, 1896, by Mr. James R. Anderson; the specimen preserved in the Canadian Survey herbarium.

Related to *V. Howellii*, but differing essentially in its narrow foliage, not cordate at base, serrated stipules, and its twice larger corollas, the spur of which is relatively much longer.

V. DELTOIDEA. Slender, 5 to 10 inches high, rather obscurely puberulent under a lens, mostly with a solitary very long-petioled radical leaf, of broadly cordate-ovate outline, with broad open sinus and evenly crenate; flowering stem naked up to the summit, there bearing two or three deltoid leaves, these nearly truncate at base, crenate on the margins, the apex sometimes abruptly acuminate and entire: stipules small, thin, ovate-lanceolate, entire or toothed: flowers 2 or 3, their filiform pedicels about equalling the leaves to which they are axillary, notably bibracteate above the middle, the bracts ligulate or even oblanceolate: corolla ¾ inch broad, light yellow, the petals broad and obtuse: sepals narrow, ciliolate.

In open woods, near Waldo, Oregon, collected by Mr. Howell in April, 1887 and 1892; on a too superficial inspection by me referred to *V. Brooksii*, but very distinct, and perhaps local. But for its deltoid foliage and manifest though fine sparse indument it would have been confused with *V. glabella*.

V. DACTYLIFERA. Very slender, about a foot high, finely pubescent, the pubescence of stem and petioles retrorse: radical leaf not known: stem naked below, leafy and floriferous only above the middle: stipules ½ to ¾ inch long, lanceolate, deeply laciniate below, the upper half being a long narrow entire segment: leaves of pedate outline, 2 inches broad, 1½ inches long, deeply parted or almost divided into 5 to 9 oblong-linear obtuse or acutish segments: filiform peduncles not equalling the leaves, bibracteolate rather near the flower, the bractlets subulate-linear, spreading: sepals 1-nerved, puberulent and ciliolate: corolla small, the rather

narrow petals brownish-red in the dry state, doubtless more yellow in the fresh.

In the Sierra Nevada of California from Plumas Co. to Fresno Co.; the best specimens from the Yosemite Valley. I have long known this species, but was wont to consider it a variety of *V. lobata;* but the characters of digitately almost divided leaves, laciniate stipules, and more especially the small short-peduncled flowers compel me to regard it as distinct.

V. PSYCHODES. Also near *V. lobata*, but low (the stems only 2 or 3 inches high exclusive of the foliage), perfectly glabrous and distinctly glaucescent, the lower face of the leaves closely puncticulate, and notably reticulate-venulose: leaves flabelliform, broader than long, cleft to the middle, or somewhat more deeply, into 3 to 5 oblong or ovate-oblong lobes: stipules ovate, acuminate, entire, or nearly so: peduncles elongated, surpassing the leaves; sepals lanceolate, 3-nerved: corolla an inch broad, the petals yellow internally and striate, the two upper larger than the others and red-purple externally.

Near Waldo, Oregon, collected by Mr. Howell in 1887 and 1892; distributed by him as *V. lobata*, which it resembles only as to the outline of its leaves, differing widely in all other characters. *V. lobata*, though described by Mr. Bentham as glabrous, is always puberulent at least, and commonly very pubescent. I speak of it as it occurs in the region whence Mr. Bentham had his specimens.

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## Critical Notes on Antennaria.

A. ARNOGLOSSA. Stout flowering stems in the female plant commonly more than a foot high, in the male about two-thirds as high; all the foliage vivid-green above and usually wholly glabrous from the first, but finely and densely

white-tomentose and permanently so beneath; the short pedicels of the heads, bracts of the involucre, and even the upper face of the young cauline leaves bearing minute colorless delicate gland-tipped hairs, with also some coarser longer brownish less distinctly glandular ones besetting the leaf-margins chiefly: mature foliage of the stolons usually 3 inches long including the petiole, and $1\frac{1}{2}$ inches broad in the middle of the variously round-ovate to obovate-spatulate strongly 3-nerved blade: female heads mostly 10 to 15, in an ultimately not very compact cymose corymb; tips of their involucral bracts from obovate-oblong to oblong-linear, obtuse, seldom even the innermost acutish: male heads 5 to 8, in a more dense cluster; milk-white tips of the involucral bracts very ample and showy, obovate or oblong-obovate, obtuse or nearly truncate, often marginate: pappus-bristles with somewhat oblanceolate scarcely more than dentate dilated tips.

Although this plant before all others of its genus would naturally take the name of *plantaginifolia*, or *plantaginea*, and is what I had in mind, as to all but the male specimens, for the *A. plantaginifolia* of page 173 of this volume, I am now unable to see how it can pass for the *Gnaphalium plantaginifolium* of Linnæus. Though the species is Virginian, and more than possibly the very one which suggested to pre-Linnæan students of Virginian botany the name *plantaginifolia* (for the name, as far as published authorship goes, is of Plukenet), yet Plukenet's figure, on which the identification of the Linnæan species depends, was probably drawn from a specimen of my *A. decipiens;* and I expect the old herbaria, if they prove anything upon this point, to prove this, that the Plukenetian, and therefore the Linnæan, *plantaginifolium* is *A. decipiens;* at least one of the segregates of that species, now found by me to be an aggregate.

A renewed study of living plants has resulted in the discovery of a glandular indument similar to that which Mr. Fernald detected in his *A. Parlinii;* but the short gland-tipped hairs will hardly be seen in the dried specimen; and

even the coarser hairs are then visible under a lens, chiefly by virtue of their dark color, for they are almost concealed by the tomentum which invests, or seems to invest, the margin as well as the lower face of the leaf.

Var. AMBIGENS. Not as tall as the type, the stems more leafy, their foliage more ample, slightly and about equally arachnoid-tomentose on both faces; the leaves and inflorescence slightly glandular, less so than in the type; heads fewer; leaves of the stolons smaller, thinner, more spatulate, arachnoid above, tomentose beneath, but even the tomentum of the lower face mostly deciduous.

Of this certainly very notable variety not many plants have been seen, and all of them females. It grows with *A. arnoglossa*, and is at the season of flowering almost hoary, while the type is bright green. It is, of all the forms growing near Washington, the latest to flower.

Of the typical *A. arnoglossa*, after many hours of careful search expended upon acres of the plant, I have found two small patches of the male; and I am glad to be able to report that these, in general aspect, as well as in the character of the inflorescence, are extremely unlike the males of *A. decipiens*. It would be impossible to confuse them, even in the poorest conceivable herbarium specimens.

The extremely plantain-like appearance of this species, rendering it, by comparison, the only *Antennaria* meriting the name *plantaginifolia*, finds expression in the Greek-made name which I have provisionally assigned it, *arnoglosson* being the ancient Greek name of plantain.

As for *A. decipiens*, of which I knew only the male plant at the time of publishing it, I am now able to give account of the female; for it is quite as common as the male, in certain localities within the District of Columbia. Moreover, in treating all the hoary-leaved (as to both faces) plantaginеous forms as belonging to *A. decipiens*, I now perceive that the name covers an aggregate of forms, several of which

are likely to obtain recognition as distinct species. I must therefore without delay designate, and more definitely characterize, what I intend as the type of

A. DECIPIENS. Flowering stems of female plant mostly 8 to 10 inches high, not notably leafy except near the base: mature leaves of the stolons relatively broader than in *A. arnoglossa*, not rarely almost truncate or subcordate at base, and with more distinct and slender petiole: heads smaller by about one-third, rather more numerous and on longer pedicels, forming a compound corymb; bracts of female involucre more numerous, their white tips narrower and more elongated, scarcely even the almost linear inner ones acute: styles and corollas in the female plant deep rose-purple, as also sometimes the corollas of the male: male plant about half the height of the female, its heads either (in small plants) few and subsessile, or (in well developed plants) with a terminal cluster exceeded by several lateral and elongated branches bearing about 3 sessile heads at the end.

Almost exclusively a dry-woodland plant, common about Washington and in Virginia and Maryland, naturally and easily distinguished from its associate species of this region by its small corymbose pinkish heads, and extremely broad though always smaller leaves. These latter, being sometimes even subcordate at base, place it almost beyond doubt that it is just this species which Gronovius described as "Elichryso affinis foliis tussilaginis sed minoribus," etc., which Linnæus, in the second edition of the *Species Plantarum*, identifies with his *G. plantaginifolium*. There is, indeed, no other *Antennaria* any of whose leaves can be said to resemble small leaves of *Tussilago*.

A. FALLAX. *A. decipiens* in part, of page 278 preceding. Plant of the size of *A. arnoglossa*, with almost the same number of equally large heads in the cluster, differing from that

in the arachnoid-tomentose upper face of the leaves, by its more numerous and narrow involucral bracts, the tips of all inner ones being sharply, almost setaceously, pointed.

Often associated, in the District of Columbia, with the woodland species, *A. decipiens*, yet as frequently seen in open places along with *A. arnoglossa;* about a week later in flowering than the former, and as much in advance of *A. arnoglossa* in this particular. From *A. arnoglossa* var. *ambigens* it is not, at a glance, to be distinguished in the herbarium; but in view of the narrow setaceous-pointed inner bracts of *A. fallax* it is easily separated from all others. Much of the northeastern plant which I referred to *A. decipiens* as first and too vaguely circumscribed, seems to be *A. arnoglossa* var. *ambigens;* and a more general investigation of this plant seems likely to result in its elevation to the rank of a species.

A. OCCIDENTALIS. Large as *A. arnoglossa* and *A. fallax*, the stolons as leafy and the habit very similar, but the 3-ribbed leaves distinctly smaller and narrower, always with blade tapering rather gradually to the indistinct petiole; pubescence of both faces of the leaf of less flocculent or arachnoid character and more truly tomentose, yet tardily deciduous from the upper face of all the foliage: cymose panicle of large female heads more open than in either; bracts of their involucre few and elongated, forming only 2 or 3 series, by their white tips appearing as in only 2 series, the outer of these obovate-oblong, obtuse and serrulate, the inner somewhat narrowly lanceolate and abruptly acuminate: male plant half as large, all its heads distinctly pedicelled and forming a corymb; tips of the hardly biserial bracts obovate, obtuse or truncate: pappus-bristles, with rather narrow and notably serrate dilatation.

Common in grassy openings among oak woods along the rivers of the Illinois prairie region, and apparently westward to Kansas; perhaps northward to Michigan; though the

Michigan specimens collected by Mr. Farwell near Detroit have too many involucral bracts, and the tips of them all narrower; so that this may belong elsewhere. The species, as to the typical plant of central Illinois, was too hastily by me concluded to form a part of *A. decipiens*, or rather, of what I have now named *A. fallax*.

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## The Genera Polycodium and Batodendron.

We have in the Eastern and Southern United States two groups of vacciniaceous shrubs either of which is at variance with all genuine *Vaccinium* in two important points of floral structure. The corollas in both groups are campanulate, while in both *Vaccinium* and *Gaylussacia* they are urceolate. The stamens also, in these campanulate-flowered shrubs, are of a structure so peculiar that, on the characters of this organ alone, a genus might reasonably be established, were concomitant characters wanting. *Vaccinium* and *Gaylussacia* are now everywhere admitted as distinct, yet, exclusive of the groups here under special notice, there is not the slightest difference of floral structure between the two. But these other shrubs depart widely from the characters of both *Vaccinium* and *Gaylussacia* not only in their open-campanulate corollas, but in respect to their stamens, which organs are doubly marked by extremely long and slender anther-tubes, and two prominent horn-like projections on the back; so that nothing approaching these characters is found in any other genera allied to *Vaccinium*.

Twice in the early part of the century, botanists of first-class ability proposed the separation of these species from *Vaccinium*. Rafinesque in 1818, not distinguishing generic differences between those types represented by *V. stamineum* and *V. arboreum* respectively—perhaps not even knowing *V. arboreum*—proposed the *V. stamineum* group for a genus under the beautifully appropriate name of Polycodium;

and Nuttall in 1843, ignoring Rafinesque's earlier proposition—just as later pretenders to taxonomic autocracy suppressed Nuttall's work—sought to establish a new genus *Batodendron* with *V. arboreum* as typical, and *Picrococcus* with *V. stamineum* for its type.

The characters of the two genera are well indicated by Nuttall, in the transactions of the American Philosophical Society, with the exception of one new and most significant peculiarity of the *V. stamineum* group which I alone seem to have observed. It is this, that in this group the corollas are *open in the bud!* For from ten days to two weeks before the actual flowering, and even from the time that the buds are green and scarcely larger than a pin-head, the corolla is open and campanulate. This is another character otherwise unknown in the family of plants to which these belong. Certainly in *Vaccinium* and *Gaylussacia* the buds are tightly closed, in an imbricate æstivation, until the corollas are full-grown and the anthers mature.

## POLYCODIUM.

Rafinesque, in American Monthly Magazine, ii. 266 (Feb., 1818). *Picrococcus*, Nuttall, in Transactions of the American Philosophical Society, 2 ser. viii. 262 (1843).

1. P. STAMINEUM. *Vaccinium stamineum*, Linn. Sp. 390 (1753). *Picrococcus stamineus*, Nutt. l. c. (1843). Species said to occur in dry woods all the way from Maine to Florida; but no doubt an aggregate of several over and above the following which have been segregated from the "*V. stamineum*" of many books and catalogues.

2. P. ELEVATUM. *Vaccinium elevatum* Banks & Soland. in DC. Prodr. vii. 567 (1838). *Picrococcus elevatus*, Nutt. l. c. (1843). Said to frequent sandy woods from New Jersey to Carolina, and reputed to be the *Vaccinium album* of Pursh (not of Linn.) and to be represented in Andrews' Bot. Repos.

t. 263. It is credited with having among other characters that of a globose berry, that of true *P. stamineum* being pyriform.

3. P. FLORIDANUM. *Picrococcus Floridanus*, Nutt. l. c. The *V. stamineum* of Elliott may be either this or the preceding. It is described as having blue berries that are edible, and therefore it cannot be any form of the real *P. stamineum*; for in all the northern shrubs the berries are hard, sour, and astringent even in their fullest maturity.

4. P. OBLONGUM. *Vaccinium oblongum*, Greene, Pitt. iii. 250 (1897). Western Tennessee.

5. P. CÆSIUM. *Vaccinium cæsium*, Greene, l. c. 249. Known only from Florida.

6. P. REVOLUTUM. *Vaccinium revolutum*, Greene, l. c. 250. Florida.

## BATODENDRON.

Nuttall, in Transactions of the American Philosophical Society, 2 ser. viii. 261 (1843). A genus perhaps more imitative of *Polycodium* than closely allied to it; the inflorescence similar, but corollas rather urceolate-campanulate than open-campanulate, not open in the bud; the stamens as in *Polycodium*, nearly, but berries very different, having a sweet, but dry granular pulp; their pedicels jointed near the summit and just below the calyx, this being a most important character.

1. B. ARBOREUM, Nutt. l. c. *Vaccinium arboreum*, Marshall, Arb. 157 (1785). Leaves dark-green, remotely and obscurely callous-denticulate: racemes with large bracts almost equalling the pedicels: corolla exactly campanulate. From North Carolina to southern Illinois and southward to the Gulf States.

2. B. SPECIOSUM. Foliage much as in the last but smaller: the racemes nearly naked, the bracts subtending the pedicels much reduced and narrow; the rachis of the raceme and also the pedicels slender and pubescent.—Shrub said to be of only half the size of *B. arboreum;* remarkably distinct by its nearly naked and quite showy racemes. It is known only from low sandy soils in Florida. Mr. Nash's n. 81, as to my set of his Florida plants, well represents the species.

3. B. GLAUCESCENS. Leaves glaucous on both faces, the perfectly entire margin ciliolate: racemes short and with bracts as large and leaf-like as in the typical species: corollas one-third smaller and globose-campanulate.—Species known to me only from the Indian Territory, where it was collected in May, 1895, by Mr. B. F. Bush.

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## NEW SPECIES OF CONVOLVULUS.

C. MALACOPHYLLUS. *Calystegia villosa*, Kell. Proc. Calif. Acad. v. 17 (1873). *Convolvulus villosus*, Gray, Proc. Am. Acad. xi. 90 (1876), not of Persoon, Syn. i. 177 (1805). Stems herbaceous, from fleshy slender rhizomes, a foot long more or less, ascending or trailing, seldom or never twining, very hoary with a dense velvety or plushy pubescence: leaves triangular-hastate, as broad as long, the broad basal lobes often coarsely toothed, flowers short-peduncled: pair of oval leafy bracts concealing the calyx, inserted close to its base; sepals unequal, the outer ones villous throughout; corolla short, the expanded limb 1 inch broad or more, creamy-white.

Common in woods of the middle Sierra Nevada of California, flowering in summer.

C. COLLINUS. *C. villosus*, Greene, Man. 265, in part, as also in part of Gray, Syn. Fl. Herbaceous like the last, and with

the same subterranean growth; the stems only a few inches long, shorter than the very long petioles of the tufted leaves: leaf-outline more reniform-hastate than in the last, the hoary pubescence truly tomentose rather than velvety, the leaves remarkably veiny: bracts at base of flower twice as long as the calyx, the outer sepals pubescent up and down the middle portion only: corolla narrower and longer than in the preceding.

Dry foothills of the Coast Range, in open ground at middle elevations. Very distinct from *C. malacophyllus*.

C. NYCTAGINEUS. Of the size of *C. malacophyllus*, and with the same underground growth, but the plant glabrous: leaves larger, of broadly ovate-trigonous outline, abruptly acute at apex, and with or without a distinct small hastate lobe on either side near the somewhat cuneately tapering base: flowers few, all in the axils of the lowest leaves; involucral bracts very thin, oval, obtuse or almost truncate, barely equalling the obtuse and mucronate sepals; corolla large, apparently pinkish.

An Oregonian species, known only in specimens distributed in 1882, by Mr. Howell, and under the name *C. Californicus;* which last (*C. subacaulis*, Greene, Man., p. 265) is a low almost stemless pubescent plant, with very different floral characters.

C. TOMENTELLUS. Rhizomatous, the slender stems solitary, prostrate or reclining, a foot long or less, very leafy with small short-petioled foliage, the few flowers from the axils of the lowest leaves; the whole plant cinereous with villous-tomentose pubescence: the sharply triangular-hastate leaves about $\frac{3}{4}$ inch long, and as broad, obviously 3-lobed, the divergent basal lobes well differentiated from, and approaching the size of, the body of the leaf: small cream-colored flowers short-peduncled; bracts closely subtending the calyx, oblong

or ovate-oblong, smaller than the smallest of the very unequal sepals, less than half as large as the largest of them: lobes of the corolla strongly pubescent at tip externally.

Mountains of southern California. Remarkable for an almost complete transition between the small real bracts of the flower and the largest of the very unequal sepals.

C. CAMPORUM. Firmly erect, from horizontal rhizomes, seldom more than 8 or 10 inches high, densely leafy, not at all twining: leaves from obovate-oblong to oblong, acute, very short-petioled, from nearly truncate to auriculate and subcordate at the narrowed base: lowest leaves with a sterile leafy branch in the axil, the few flowers appearing only in the axils of the next lowest leaves, these large, pure white.

Common along the borders of the thickets, and also in open ground, throughout the prairie regions of northern Indiana, Illinois, Wisconsin, etc.; always heretofore mistaken for *C. spithamæus;* but this last is a broad-leaved partly twining plant, with flowers borne near the middle of the stem. *C. stans*, of Michaux, is more related to our new species, yet again perfectly distinct from both. If it has the broad cordate leaves of *C. spithamæus*, it has the almost basal flowering, and the erect low growth of *C. camporum;* but this new one is strongly characterized by the form of its leaves, as well as by their densely clothing the stem.

C. AMERICANUS. *C. sepium*, var. *Americanus*, Sims, Bot. Mag. t. 732 (1804). In naming the reddish color of the flowers as the only notable peculiarity of the American plant, Sims might have done better. Pinkish flowers occur in true *C. sepium* of Europe; and while the white-flowered and genuine hedge bindweed doubtless exists as introduced in eastern North America, the native plant is also to be found, here and there, with white corollas. The American plant, so long known superficially, differs I think constantly, and specifically, not only in being more or less pubescent, but

exhibiting a much more sharply angled leaf, the basal lobes of which are far more pronounced in size, and at a wider angle of divergence from each other. The stigmas also in our plant are narrower and more elongated. The seeds, if ever observed, are likely to show character; but it is remarkable that, of our plant as well as of the European, these are seldom found.

C. LIMNOPHILUS. Subterranean parts quite as in the preceding, the stem more slender, closely twining from base to summit, mostly only 2 or 3 feet high, the herbage glabrous or only obscurely puberulent or pubescent: leaves narrow, sagittate, the basal lobes nearly or quite entire, a fourth or a third as long as the body, this acute or acuminate: bracts large, closely enfolding the calyx but unequal, the lower and larger strongly auricled at base and partly enfolding the truncate upper one: corolla large, pinkish: capsules apparently all seminiferous, the 3 or 4 seeds large, dull-black, sparingly muriculate-roughened.

Plentiful in tidal marshes about the northern end of San Francisco Bay and its tributaries; rooting in tidal mud, and twining upon the maritime reeds and rushes of the district; in the Bay-Region Manual erroneously treated as mere *C. sepium*, from which its sagittate leaves, very peculiar bracts, and its hydrophilous nature declare it distinct.

C. GRACILENTUS. Roots fibrous; the tufted ascending stems a foot high or more, slender, not twining except feebly at the sterile leafy summit above the flowers: herbage canescently villous: leaves an inch long or more, triangular-sagittate, the moderately divergent basal lobes more than half as large as the main blade, the slender petioles hardly a half-inch long: axils of the middle leaves bearing each an elongated and almost filiform one-flowered peduncle, this with a single pair of leaves (like the ordinary ones, but smaller) about $\frac{1}{2}$ inch below the calyx: the unequal sepals

all broad, truncate and mucronate, pubescent: corolla an inch long, white or cream-color.

Collected at Mormon Bar, Mariposa Co., California, in May, 1895, by Mr. J. W. Congdon. Remarkable for the conspicuous pair of unaltered leaves which subtend the calyx at some distance below it, and which take the place of the bracts which, in typical *Convolvulus*, enfold and conceal the calyx.

C. ARIDUS. Stems tufted on a branching root, at first ascending, at length several feet long, leafy and floriferous throughout and strongly twining; herbage somewhat cinereous with a short fine pubescence: all except the lowest leaves subsessile, triangular lanceolate, very acute, the base shortly sagittate-lobed and clasping: peduncles twice exceeding the leaves, 1-flowered: bracts ovate-lanceolate, thin, closely investing the calyx, the sepals of which are also ovate-lanceolate and acute: cream-colored corolla rather large, $1\frac{1}{2}$ inches long, and as broad.

Desert foothills in the interior of southern California; twice distributed by Mr. Parish as *C. occidentalis*, which is an extremely different plant of the seaboard.

C. NUTTALLII. *C. occidentalis*, var. *tenuissimus*, Gray, in part. With fibrous roots and numerous long trailing or twining stems, these with woody and persistent base: herbage with minute and sparse but tomentulose pubescence: leaves an inch long or more, petiolate, strongly sagittate or hastate, the main blade triangular-lanceolate, the long basal lobes from narrow and entire to broader and deeply toothed or bifid: flowers solitary, on long and rather stout peduncles: bracts closely subtending the calyx, from somewhat larger than the sepals to distinctly smaller than them, oval or ovate, obtuse or even truncate, mucronate; the sepals very similar; corolla whitish, $1\frac{1}{2}$ inches long and as broad: the small black seeds coarsely tuberculate.

Common in open ground among the hills along and near

the seaboard in southern California; sometimes trailing over the ground, sometimes twining several feet upon shrubs.

C. DELTOIDEUS. Wholly herbaceous, the root possibly rhizomatous: stems 2 or 3 feet long, twining; herbage cinereously and softly pubescent: lowest leaves broadly cordate-ovate and obtuse, on long and slender petioles, the middle cauline somewhat hastately deltoid and broader at base than long, acutish, rather short-petioled, those of the sterile upper part of the stem with only a trace of the hastate basal lobe, thus almost exactly and sharply deltoid: peduncles solitary in the axils of the middle leaves, not equalling the leaves, 1-flowered: calyx subtended by a pair of small hastate-deltoid petiolate leaves inserted nearly their own length below its base: the broadly oval sepals very unequal, the outer ones truncate, the others merely obtuse: corolla white: stigmas well surpassing the strongly sagittate anthers.

Collected only by the writer, near Tehachapi, Kern Co., California, 22 June, 1889.

C. MACOUNII. Dwarf and upright, the leafy stems only 3 to 6 inches high, proceeding from a deep-seated rhizome: herbage wholly glabrous; leaves broadly sagittate, 2 inches long, on petioles of equal length: peduncles surpassing the leaves: bracts very ample, $\frac{3}{4}$ to 1 inch long, oval, obtuse, broad and somewhat auriculate at base: white corolla also very large, more than 2 inches long.

Milk River, Assiniboia, August, 1895, Mr. John Macoun; the specimens, under n. 11,883, distributed for *C. spithamæus*, to which species this very distinct new one bears no near affinity.

C. POLYMORPHUS. Herbaceous to the base, probably rhizomatous underground, the twining stems 2 to 4 feet high; herbage commonly pale and puberulent: leaves from

reniform-hastate to narrower and subsagittate, rather prominently and sharply mucronate: peduncles short, about equalling the short-petioled leaves, 1-flowered; calyx subtended by a pair of narrowly elliptic bracts at a short distance below it, their tips either reaching the bases of the sepals, or longer and partly embracing them: sepals very unequal, the outer often broadly oval and truncate and only half the length of the innermost, these being much narrower, and from obtuse to acute: corolla an inch long or more, yellowish; the narrowly linear stigmas much or little surpassing the anthers.

Very common species of northern California and southern Oregon, among the hills and on the plains; appearing in such diversity of form as to indicate the possibility of more than one species; for the distinguishing of which, however, no constant characters are to be found in the dried specimens. Mr. Howell's n. 1948, from near Roseburg, Oregon, differs from the more typical Californian plant in that its leaves are broader and nearly glabrous; its sepals, though very unequal, are all broad, truncate and mucronate, and it has a more elongated style.

C. PURPURATUS. *C. lutcolus*, var. *purpuratus*, Greene, Man. 265 (1894). Suffrutescent, or even shrubby, with long naked grape-vine-like woody stem, the leafy and flowering branches mantling the summits of small trees: herbage glabrous: peduncles mostly bearing a cyme of several flowers, both the cyme itself and each individual peduncle bearing a pair of linear or lanceolate herbaceous bracts: limb of corolla (pink, purple or dull creamy white) with entire and perfectly circular limb.

Common along the seaboard in middle California, especially about San Francisco Bay. In open dry ground usually trailing over rocks and bushes, and merely suffrutescent; but in groves and along streams, large, high-climbing and vine-like.

C. FRUTICETORUM. Suffrutescent like the last, but seldom or never high-climbing: leaves ample and subsagittate, puberulent: flowers cymose and bracted as in the last: corolla cream-color or almost white, its limb strongly 5-angled in full expansion.

As common on bushy foothills of the inner Coast Range of California as *C. purpuratus* is upon the seaboard; the two much alike in habit, but corollas extremely different.

Both *C. purpuratus* and *C. fruticetorum* are included in the *C. luteolus* of Gray. The former is the *Ipomæa sagittifolia* of Hooker & Arnott, and therefore the type of Gray's species; but both those specific names were preoccupied in *Convolvulus* before the Californian species began to be known.

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Since *Convolvulus camporum* at page 328 preceding was published, there has appeared in the third volume of Britton & Brown, a figure which almost represents this species. I refer to that which purports to represent, in that volume, *C. spithamæus;* which species, as I before stated, is both branched and twining, and has no flowers at or near the base of the stem. *C. stans*, a plant which at the North seems to replace *C. spithamæus*, appears always to have its leaves very pronouncedly and subsagittately lobed at base. I cannot but think that the figure on page 26 of the volume named, was taken from a specimen of *C. camporum*, though it is not very accurate even for that species.

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## SOME CANADIAN VIOLETS.

Those well known and zealous investigators of British American botany, Messrs. John and James M. Macoun, spending this season at home in Ottawa for the first time in many years, have naturally taken up the investigation of the common wild violets of Ontario. I say naturally, as

meaning that the renewed interest which has been awakened during the last three years, in the Eastern U. S. violets, could hardly have failed to suggest the desirability of a further study of the East Canadian representatives of the genus.

Whatever of value these notes may contain, is largely if not chiefly due to abundant living specimens, and very copious and intelligently made field-notes, which have been forwarded to me by the younger Mr. Macoun; whose modesty alone seems to have stood in the way of his publishing them himself; for all the new species here described were so carefully studied by him, that, independently of my own opinion, he regarded them as undescribed.

V. SEPTENTRIONALIS. Acaulescent, gregarious, low, 4 or 5 inches high at petaliferous flowering; herbage rather light green, the leaves and petioles sparsely clothed with stiff straight spreading hairs, these most numerous beneath and along the veins: leaves from reniform in the lowest to round-cordate, strongly cucullate when young, lightly and very regularly crenate, all obtuse: peduncles about equalling the leaves, bibracteolate near the middle: sepals small for the size of the flower, with prominent truncate auricles, the whole margin finely and closely ciliate: corolla pale violet, rather large, 9 or 10 lines long and broad, all the petals broad, usually all obcordate-notched at the broad apex, the upper pair sometimes merely obtuse; the odd or lower one amply expanded and as long and as broad as the others, this and the pair next to it hairy at base (on the claw), and sparingly so on the blade: apetalous flowers aerial, but on very short, slender and horizontal peduncles, their pods very short and nearly oval.

Rich soil along the borders of thickets, near Ottawa, Ontario, in full petaliferous flower 10 May, 1898, and in fruit from the apetalous flowers a month later, J. M. Macoun; Canadian Survey n. 18,561. Its southern and eastern

U. S. homologue is the plant called by me *V. obliqua* on page 142 preceding; but it is also allied, and by its foliage more nearly, to *V. cuspidata* of the far-western lake and prairie regions, and distinct enough from either, by a redundancy of characters. If it has the hairiness of *V. cuspidata* it has quite another quality of herbage, aerial apetalous flowers and fruits, and large pale obcordate petals instead of deeply colored and cuspidately acute ones.

V. Macounii. Rather larger than the preceding; early leaves subreniform-deltoid, 1 inch long, 1½ inches broad, firm and rather fleshy, crenate, villous-hirsute beneath and on the upper part of the petiole, only sparsely hairy above, but the margin ciliate: pedicels bibracteolate in the middle; sepals broad, obtuse, ciliate, somewhat callous-tipped; petals lavender-color, very deciduous or almost caducous, all remarkably narrow and elongated, the two upper rather smaller than the others, the odd one the largest, all sparsely hairy over almost the whole inner face, the claws more or less distinctly ciliate: peduncles of the late apetalous flowers slender, short, horizontal, buried under decaying leaves or twigs; their pods distinctly trigonous, short and thick, as broad as long, dark with numerous purple blotches, the shortly and obtusely lanceolate sepals and their auricles ciliate.

On dry limestone shingle, growing among grasses in the shade of cedars (*Thuya*) near Ottawa, J. M. Macoun; n. 18,746 of the Geol. Survey; and near Hull, Quebec, John Macoun, n. 18.900. Very different from all other North American violets by its notably narrow hairy petals; nor have we any other of such habitat.

V. venustula. Dwarf, with light-green glabrous herbage: leaves cordate-ovate and deltoid-ovate, acutish, rather sharply and serrately crenate, cucullate when young, the blade less than an inch long, the slender petioles 1 to 3 inches long: earliest peduncles barely equalling the leaves,

the later surpassing them: corolla large for the plant, often ½ inch or more in breadth, deep violet-blue; petals broad, obtuse, the odd one well expanded, nearly equalling the others, truncate or retuse, only the two laterals bearded at base with clavellate white hairs: earliest apetalous flowers on slender peduncles equalling the leaves, but all the later ones short peduncled and almost or altogether subterranean; capsule very short and thick, roundish-obovate.

Inhabiting wet meadows and growing upon tussocks along with *V. blanda*, near Rideau Hall, Ottawa, 23 May, 1898, J. M. Macoun, n. 18,565 of Geol. Survey. Also from Charlottetown, Prince Edward Island, by Mr. Laurence Watson. Quite analogous to the more southerly bog-meadow violet, *i. e.*, the true *V. cucullata*, but very distinct by its small size, deep violet corollas of large size for the plant, and especially by its short and almost globose capsules.

V. CUCULLATA, Ait. Kew. iii. 288; Smith in Rees' Cycl; Greene, Pitt. iii. 143. This excellent species, suppressed by all recent students of North American violets, until the present writer, two years since, indicated for the first time in its history the real characters by which it could always be distinguished, is now again freely admitted by all who have studied it and its allies in the light thus newly thrown upon the subject. My doubts, then frankly expressed as to the identity of this blue-flowered bog-meadow violet with Aiton's plant, have been banished. The fuller account of *V. cucullata*, given by Smith in *Rees' Cyclopedia*, at a time when the original was probably still growing at Kew, and perhaps in other London gardens, seems to leave little if any room for question that this, the most strongly and most permanently cucullate-leaved of all our violets, is the one which the author of the *Hortus Kewensis* had in view as *V. cuculiata*. That the species extends into Canada is made certain by some very fine sheets of specimens, obtained this year by Mr. Macoun. Its number, in the collection of the Canadian Survey, is 18,747.

V. AFFINIS, Le Conte, Ann. N. Y. Lyc. ii. 138. This fine species, common enough in most woodlands of the District of Columbia and adjacent Maryland, was identified by me to my own satisfaction by Le Conte's excellent description, nearly two years since, and long anterior to my obtaining possession of that priceless ionological treasure, the volume of that author's unpublished colored drawings of his violets. The drawing and coloring are perfect; and the species will of necessity be admitted on all hands as valid. I mention *V. affinis* here for the reason that Mr. James Macoun finds it in Canada, at Billing's Bridge, Ontario. He sends it to me under number 18,771. He has not identified it, but remarks that it seems an ally of *V. venustula;* which is perfectly correct. The two are much alike in the possession of a leaf that is broadly and beautifully cordate at base, without evidence, in the dry, of being at all cucullate, the apex being in both very notably acute—almost acuminate.

V. POPULIFOLIA. An acaulescent blue-flowered woodland violet akin to *V. cuspidata*, but smaller, the petioles of the early leaves densely villous-hirsute, the blade from broad-cordate in the very earliest and smallest, to deltoid or deltoid-reniform in those accompanying the petaliferous flowers, notably broader than long, both surfaces, but more conspicuously the lower, hirsute-pubescent, especially along the veins: corollas large, rather light blue, all the petals broad and obtuse, the odd one like the others but a little longer; sepals of the petaliferous flowers oblong, obtuse, hispidulous below, especially the auricles: apetalous flowers of summer and autumn very short-peduncled and horizontal or partly buried, but the peduncles slender; sepals small, glabrous; pods triquetrous-ovoid, finely dotted, 4 or 5 lines long: late foliage nearly glabrous, but rather fleshy.

From woods near Port Flamboro, Ontario, collected by Mr. J. M. Dickson, from whom I have herbarium specimens, and also living plants now flourishing in the garden.

I at first, and in the herbarium, took this to be a probable form or variety of *V. cuspidata;* but since having grown the two side by side, I perceive abundant specific distinctions, the most obvious one, at all seasons and stages, is the deltoid leaf-outline of *V. populifolia.* It is in the Canadian Survey Herbarium under n. 18,752.

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## A Fascicle of New Labiatæ.

Hedeoma diffusa. Low, suffrutescent, the numerous branches tufted on a branching woody caudex, from strongly decumbent to almost prostrate, 3 to 6 inches long, the herbage from hoary-tomentulose in the northern and typical form to merely cinereus-pubescent in the more southerly specimens: lower leaves short-petiolate, the blade from orbicular to round-ovate, entire, scarcely 2 lines long, the upper and floral commonly ovate: flowers few in the axils: calyx small, only 1½ or 2 lines long including the rather short and subequal teeth, the tube gibbous, hispidulous on the ribs: corolla very large for the plant, the tube little exserted, but limb ample, rich purple.

Species as far as known confined to Arizona, where, in several forms, it ranges from north to south throughout the State; the type being a plant obtained near Flagstaff by H. H. Rusby, in 1883, and distributed under a manuscript name of mine which is not here taken up, not being appropriate to the more southerly forms of what I take to be specifically the same. It was obtained again at Flagstaff, in 1891, by Mr. D. T. McDougal. The less diffuse and less distinctly hoary plant was collected by myself, in the southeastern part of Arizona, near Wall's Ranch, 4 Sept., 1880. This appears to have been the earliest gathering. This same is in the U. S. Herbarium from Cedar Springs, by Toumey, 1892. The whole was referred, by Dr. Gray, as far as known in his day, to his rather confused *H. thymoides.*

HEDEOMA NANA. *H. dentata*, var. *nana*, Torr. Bot. Mex. Bound. 130. *H. thymoides*, Gray, Syn. Fl. 362 in part, not of Persoon. The name *H. thymoides*, Gray, being revertible, I adopt as specific the above, for what appears to be the type of Gray's species.

HEDEOMA BLEPHARODONTA. Slender decumbent stems 6 inches high, tufted on a ligneous caudex, leafy and floriferous throughout, the internodes short, the whole stem leafy-spicate; herbage green but sparingly pubescent: leaves 3 or 4 lines long, oblong, entire: flowers few in the axils and small: calyx-tube scarcely gibbous, its ribs not hispid; calyx-teeth very unequal, strongly though sparsely hispid-ciliate.

Near Flagstaff, Arizona, Aug., 1884, M. E. Jones. Specimens in the U.S. Herbarium.

LYCOPUS ASPER. Stems stout, simple, 1 foot high or more, very leafy and with short internodes, the angles obtuse: leaves of firm texture, almost subcoriaceous, sessile, oblong-lanceolate, acute, very evenly and saliently serrate throughout, notably veiny, roughened on both faces by coarse gland-dots and short scabrous hairs: calyx-teeth large, ovate-lanceolate, acuminate, not spinose-tipped, scabrous-serrulate marginally: nutlets very short, smooth, outline of the back cuneate-obovate, the callous margin much broader at summit than in its extension down the sides.

A most distinct sessile-leaved *Lycopus*, occurring in the Langlois Herbarium at the Catholic University, collected at Battle Lake, Minnesota, Aug., 1892, by Mr. E. P. Sheldon, and distributed as *L. lucidus obtusifolius*. The species is soboliferous, that is, propagating by wholly subterranean rhizomatous offshoots; these rather short and stout at the time the plants were gathered.

LYCOPUS LACERUS. Stem rather slender and somewhat flexuous, 2 feet high, sharply angular and the angles

roughish with scattered minute stiff suberect hairs; similar ones roughening the veins and veinlets of the lower face of the leaves, the plant otherwise glabrous, pale green: leaves of lanceolate outline, 1½ to 3 inches long, rather coarsely and somewhat evenly serrate, more commonly cut into irregular rather deep lobes, the base narrowed strongly to a short but distinct petiole: calyx-teeth broadly subulate, pungently acute: nutlets very small, obovate, the marginal callosity thick and narrow, of equal width around the summit and at the sides.

An exceedingly well marked Californian species, seen only in my own herbarium; the specimens collected partly by Elmer Drew, in the Sacramento Valley, at Elk Grove, in 1888, and partly by Mr. Parish, who has distributed the plant as *L. sinuatus* from "wet meadows of the San Bernardino Valley, Sept., 1888." None of the specimens exhibit a stoloniferous or soboliferous propagation.

LYCOPUS MARITIMUS. Tall and stout, commonly 3 feet high, simple or with a few ascending branches from below midway of the stem, this rather sharply angled and the angles beset with rather copious spreading hairs, the veins and veinlets of the leaf somewhat scabrous: leaves oblong and lanceolate-oblong, 2 or 3 inches long, cuneate at base and subsessile, rather coarsely but not unevenly serrate: calyx-teeth ovate, acuminate not pungent, minutely and hispidulously ciliolate: nutlets rather large, copiously resinous-dotted ventrally, dorsally cuneate-quadrate, the callous margin obscure.

Plentiful in brackish marshes about San Francisco Bay; the description here drawn from copious specimens obtained by the writer in the Suisun marshes in the autumn of 1889. There is no evidence of vegetative propagation except by the spreading of the regular main rhizome, which extends rather deeply underground.

STACHYS INGRATA. Stout and tall perennial, 3 feet high or more, scarcely canescent, but loosely villous throughout, and covered with small sessile yellow glands under the pubescence, the thin and soft fresh herbage intolerably fetid: leaves 3 to 6 inches long, ovate-lanceolate and ovate-oblong, serrate-toothed, obtuse, short-petioled: spike terminal, dense, leafy-bracted at base, the upper bracts small and obscure: calyx very villous-hirsute, the triangular-subulate teeth nearly as long as the tube and merely pungently acute: corolla short and small, apparently white or very pale.

Frequent at middle or lower altitudes of the Californian Sierra Nevada; the type specimens from Miss Emma S. Harrison, June, 1887.

STACHYS STRIATA. Herbage greenish but soft-pubescent as in the last, but the more slender stems only 1 or 2 feet high; leaves smaller, less obtuse, not glandular underneath the hairiness: spike elongated and more interrupted: calyx thin, only sparsely villous, the tube finely many-striate, the teeth subulate, nearly as long as the tube, pungently acute: corollas pinkish or purplish, rather broad, but the tube scarcely equalling the calyx.

From Plumas County, California, July, 1882, Mrs. Austin; also by the same on shores of Goose Lake, Modoc Co., 1895.

STACHYS LITTORALIS. Tall and strict, the stem 2 or 3 feet high, with few pairs of leaves and long internodes; whole plant green and nearly glabrous: leaves oblong, obtuse, coarsely crenate, all but the small lowest ones subsessile: spike elongated and interrupted: fruiting calyx almost campanulate, the short almost deltoid pungently acute teeth much shorter than the tube, and this rather distinctly striate somewhat as in the preceding.

Rocky shores of Egg Lake, Modoc Co., California, 25 July, 1893, Milo S. Baker; also in a reduced and more pubescent state on the banks of the Truckee River, by the author, in July, 1895.

STACHYS LANUGINOSA. Slender and rather sparsely leafy, 1 to 3 feet high, the acutely angled stems loosely and almost flocculently woolly: leaves small for the plant, oblong, obtusish, serrate-toothed, subsessile, somewhat villously tomentose on both faces: verticillasters of the spike rather remote: calyx-tube concealed by a dense long white wool, only the broad-subulate spinescent teeth exserted; corollas small with very short tube, the upper lip long-woolly.

Mountains of Fresno Co., California, 1890, Mrs. Peckinpah. Remarkable for the excessive woolliness of the calyx-tube; in which point it resembles *S. pycnantha*, but is otherwise extremely different.

STACHYS BRACTEATA. About 2 feet high, erect, usually without a branch, leafy up to the single rather short and dense sessile notably bracted spike; herbage green, but foliage sparsely appressed-pubescent; angles of the stem retrorsely hispidulous: leaves oblong-lanceolate, acutish, crenate, about 2 inches long, subsessile: lower verticillasters axillary to rather ampliate leafy bracts, the upper bracts ovate-lanceolate, purplish, ascending, somewhat imbricated on the yet undeveloped parts of the spike: calyx very villous and glandular, the triangular-subulate teeth nearly as long as the tube: corolla short, purplish.

Plumas and Modoc counties, in northern California, Mrs. Austin; also eastward in Nevada. This forms a part of the *S. palustris* of Asa Gray, but is very distinct, by many good characters, from the Old World plant so named.

STACHYS SCOPULORUM. Size of the last, often much branched from the decumbent base of the main stem: stem loosely or interruptedly spicate throughout half its length, its angles very hirsute with long spreading hairs: leaves oblong-lanceolate, acute, serrate, 2 inches long, subsessile: bracts of the inflorescence as large as in the last, but not obvious, deflexed: calyx hispidulous, its triangular and aristate-pointed teeth shorter than the tube: corollas rather ample, but short, rose-purple or pink.

The common marsh *Stachys* of the Colorado Rocky Mountains; having long figured, but altogether erroneously, as *S. palustris.*

STACHYS MALACOPHYLLA. *S. velutina*, Greene, Eryth. ii. 121. The name at first proposed for this large segregate from the *S. albens* of Gray, had long been preoccupied for an Old World species, as the last volume of the *Index Kewensis* shows.

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## NEW OR NOTEWORTHY SPECIES.—XXIII.

SAXIFRAGA RHOMBOIDEA. Stem leafless and scapiform, stoutish, 5 to 10 inches high, pubescent: leaves all in a radical tuft, usually depressed and rosulate, the earliest ones rhombic-ovate, the later more oval, 1 to $2\frac{1}{2}$ inches long including the broad short petiole, variously toothed, often crenate, sometimes repand-dentate, glabrous or the margins short-hairy: flowers small, white, in a commonly dense ovoid capitate-terminal cluster, but this in fruit becoming somewhat obviously branched and thyrsiform: petals white, spatulate-obovate, usually emarginate.

Common species of dry open slopes, chiefly in the belt of *Pinus ponderosa*, in the Colorado Rocky Mountains, thence northward to Montana and southward to New Mexico; long referred to the Old World *S. nivalis*, a very different alpine or subarctic species. Mr. Holm, who has independently made a careful anatomical study of *S. nivalis* and its allies, informs me that this Rocky Mountain plant bears internal evidence of a closer relationship to *S. integrifolia* by far, than to *S. nivalis.* *S. rhomboidea* has an American but high-northern ally in *S. radulina* of page 308 preceding.

ABRONIA CARNEA. Near *A. micrantha* (*i. e. A. cycloptera*, Gray), but the whole plant much stouter and larger, the root probably perennial: perianths four or five times as

large, tubular-funnelform, of a deep reddish flesh color: fruit nearly $1\frac{1}{2}$ inches long, more than an inch broad, the body between the wings marked by 3 (rarely 2, or even 1) prominent closely parallel ribs.

Collected at Las Cruces, New Mexico, June, 1897, by Mr. E. O. Wooton, and distributed as "*A. cycloptera;*" from which it is abundantly distinct by characters of flower and fruit; and it seems to be perennial, whereas that species is certainly annual.

ABRONIA ANGUSTIFOLIA. Stout prostrate or merely assurgent stems 2 or 3 feet long and with swollen nodes; herbage minutely hirtellous-roughened and viscid: leaves from oblong-lanceolate to oblong-linear, obtuse, veinless, their petioles hardly as long as the blade: bracts of the head subulate-lanceolate, herbaceous: perianths small; wings of the small turbinate fruits reticulate-veiny and marginally densely hispid-ciliolate; the whole summit of the fruit hispidulous.

White sands of Doña Ana Co., New Mexico, 16 July, 1897, E. O. Wooton.

AMARANTUS VISCIDULUS. Somewhat succulent, diffusely branched from the base, the prostrate branches a foot long or more, leafy and floriferous throughout: leaves small, narrowly obovate or spatulate, obtuse, tipped with a long spine-like slender mucro: all the branches, branchlets and the petioles strongly pubescent and somewhat viscid: spikelets crowded, their bracts subulate-lanceolate, spinescent above the middle and slightly curved outward: fruit not known.

In the Sierra Blanca of southern New Mexico, E. O. Wooton, 1897; distributed for *A. blitoides*, which it is quite like in habit, but from which it differs widely in being pubescent and viscid; the bracts of the inflorescence being wholly different in character.

EUPHORBIA MARILANDICA. Perennial, with pale-green glabrous glaucescent herbage, the bushy trichotomous stems about a foot high from long horizontal roots or rootstocks running only a little below the surface of the ground: leaves 1½ inches long, the lower in whorls of 3 (corresponding to the trichotomous branching); those of the branches opposite (the branches being dichotomous); those of the loose inflorescence reduced to (opposite) subulate white-tipped bracts; all the proper foliage lance-linear, entire: involucres as in *E. corollata* but smaller, the appendages more nearly orbicular: fruit not known.

Common among the sandhills of Anne Arundel Co., Maryland, about ten miles south of Baltimore. An ally of *E. corollata*, remarkably distinct from that species by its vegetative characters; the roots being horizontal and quite superficial rather than deep-seated; the stem trichotomous from near the ground, and all the lower leaves correspondingly in whorls of three; the upper branches all dichotomous, and their subtending leaves opposite. In its low bushy-spreading habit the plant simulates certain species of the *Anisophyllum* section of the genus.

ARGEMONE LEIOCARPA. Resembling *A. Mexicana*, and with similar smallish yellow petals, but herbage more glaucous, the whole stem, calyx, and even the capsules devoid of prickles; but the leaf-margins more strongly spinescent: capsules oblong, one-third larger than in *A. Mexicana*, and more obtuse, the stigmas almost sessile; valves of the pericarp transversely rugose-veiny but otherwise smooth and glabrous.

This interesting plant has long been imperfectly known as inhabiting Key West. Mr. Pollard and his companions have lately brought thence good herbarium specimens, while almost simultaneously Seargt. Ivar Tidestrom, my former pupil, has sent me a number of sheets of it from

Tampa, Florida, where he reports it as growing along the seashore.

ARGEMONE GRACILENTA. Apparently several feet high, upright, slender, sparingly branched and sparsely leafy: stem rather strongly armed with straight spreading prickles; leaves small, narrow, scarcely lobed but undulate, bearing several prominent marginal prickles, and a long and stout terminal one: sepals with the usual apical spine and several small and slender prickles upon the surface: petals white, 1¼ inches long: pods small, ovoid, prickly.

Muleje, Lower California, 1887, Edw. Palmer. Species of well-defined aspect, and indisputable characters.

ARGEMONE BIPINNATIFIDA. Root perennial: somewhat clustered stems very stout, a foot high more or less, densely leafy, very hispid with somewhat unequal spreading prickles, and sparsely hirsute underneath the armature, both the prickles and the underlying pubescence extending to the lower face of the ample bipinnatifid leaves, these subsessile, spreading or somewhat recurved: sepals rather densely aculeate, but not pubescent, the prickles somewhat appressed: corolla 3 or 4 inches broad, the flowers several and subsessile in a cluster at the summit of the stem and its few short branches: pods barely an inch long, strongly armed with ascending prickles; valves 4 only.

Common on gravelly knolls and bleak stony slopes of the hills of southern Wyoming. Root strictly perennial; and the plant, from the altitude which it holds, must be considered subalpine.

CAKILE FUSIFORMIS. Glabrous annual, 2 feet high, the herbage not notably succulent, the thin leaves mostly 3 or 4 inches long, tapering very gradually to the petiole, the blade deeply pinnatifid, the segments few and remote, oblong-linear, obtuse: raceme a foot long or more in fruit, rather lax: silicles nearly an inch long, slenderly fusiform, the lower and

sterile joint especially slender and subterete, the upper twice as long, indistinctly angled, the seminiferous body tapering to a beak of nearly its own length.

Mangrove Key, off the coast of Florida, C. L. Pollard, 10 March, 1898. Perhaps the same as *C. maritima* var. *æqualis*, Chapm., though it does not answer to his description; and his plant is far from being the equivalent of the true *C. æqualis* of the West Indies, which has almost linear silicles, and leaves merely toothed.

ANTENNARIA FARWELLII. Stoutish and rather low, the immature (not yet flowering) leafy stems 5 or 6 inches high; basal leaves of the preceding year about 2 inches long, with broadly spatulate very obtuse blade tapering cuneately to a short and narrow linear petiole, the blade traversed by three distinct and rather prominent veins, both faces permanently (the upper thinly) tomentose: heads few and large: bracts of the involucre in several series, all with long white tips, those of the outer linear-oblong, obtuse, of the inner linear-lanceolate, some acutish, others obtuse.

In dry woodlands at Clifton, Keweenaw Co., Michigan, 15 May, 1884, O. A. Farwell. Imperfectly known; the specimens being too young, scarcely in flower; but in the characters of its foliage the species is exceedingly well marked.

ANTENNARIA CALOPHYLLA. Stolons short and stout, leafless except at the end; the tuft of leaves rather full, the leaf very large and of remarkably thin texture for the genus, the broadest full 2 inches in diameter and not much longer than broad, mostly of oval outline, some rhombic-ovate, others broadly elliptical, usually very obtuse, scarcely mucronate, some with blade rounded at base, others more cuneately tapering to the relatively short winged petiole, conspicuously 3-veined beneath, but the venation scarcely appearing on the upper surface, densely silvery-tomentose beneath, dark green and flocculent above: flowering stem very short (only the male known), only 3 to 5 inches high: heads 4 to

6, glomerate and sessile in flower; bracts of the involucre with obovate retuse or emarginate white tips: widely dilated tips of the pappus-bristles rather sharply serrate.

Very plentiful in open woods, among rocks, in the limestone region of southern Illinois, near Cobden, F. S. Earle, 30 March, 1879, male plant, in flower only; also the mature foliage from the same locality, collected by the present writer in June, 1898; and again in similarly mature summer foliage from the other side of the Mississippi, in Missouri, 1898, B. F. Bush. Related to the exclusively Southern *A. solitaria.*

PYRROCOMA GENUFLEXA. Glabrous, slender and low, the subscapiform stems usually monocephalous, upright from a short and strongly decumbent base, only 6 to 10 inches high: radical leaves unknown, the cauline few and small, even bract-like, linear-lanceolate, entire, sessile by a somewhat clasping base: involucres campanulate, $\frac{3}{4}$ inch high, their ample and much imbricated bracts erect, spatulate-oblong and with conspicuous oval cuspidately mucronate green tips: rays numerous but short and suberect, saffron-color.

Near Flagstaff, northern Arizona, 5 Sept., 1894, J. W. Toumey; labelled "*Aplopappus croceus,*" though the species is not very nearly related to *P. crocea.* Its rays, though saffron-colored, are short and inconspicuous, while in its other characters the plant more nearly approaches some Oregonian members of its genus.

SOLIDAGO SUBVISCOSA. Rigid but rather slender, erect, a foot high, very leafy up to the small close panicle or thyrsus of few and large heads: lowest leaves not known, those of the stem lanceolate or ovate-lanceolate, acute, entire, green on both faces but scabrous and somewhat glandular, the margins scabrous-ciliolate: heads 10 to 18 or more, about $\frac{1}{2}$ inch high; bracts of involucre remarkably few and little imbricated, largely green-herbaceous, acute and some recurved at tip, scabrous and viscid: rays rather many, and long, deep-yellow.

A very notable new plant, obtained by Mr. Toumey in the Chiricahui Mountains, Arizona, 15 Sept., 1896. It combines some of the characteristics of *S. Bigelowii* and *S. Parryi*, *i. e.*, the *Aplopappus Parryi* of Gray, both of which are indigenous to the same general region.

SENECIO TOUMEYI. Perennial, the several rather slender and subcorymbose scapiform flowering stems $\frac{1}{2}$ to 1 foot high, these and the growing foliage white with a villous-lanate pubescence: leaves of the short caudex subcoriaceous, persistent through the winter, glabrate above, hoary beneath in age, of spatulate-oblong or -obovate outline, 1 to 3 inches long, tapering to a petiole almost as long, the margin variously crenate or dentate: heads about $\frac{1}{3}$ inch high, the involucral bracts linear-lanceolate, thin, almost silky-tomentulose: rays light-yellow, rather broadly oblong and short.

In the Chiricahui Mountains, Arizona, 20 Sept., 1896, J. W. Toumey. Allied to *S. Bernardinus* (page 298 preceding), but with pubescence of quite another character, and the foliage widely different. *Senecio Neo-Mexicanus* is also of the same group; though that has lyrate foliage, and is vernal in its flowering; this being autumnal.

LOBELIA HIRTELLA. *L. spicata* var. *hirtella*, Gray, Syn. Fl. ii. 6. Differs from *L. spicata* not only by the rough pubescence observed by Gray, but more notably by its copious leafiness, pronouncedly callous-dentate foliage, and especially by an almost leafy-bracted spike, the lower flowers being axillary to leaves which far exceed and often almost conceal them: the calyx-lobes not only hirsute-ciliate but also distinctly, though minutely, auricled; by which character the species is brought into contrast with *L. leptostachys* rather than with *L. spicata*.

Here defined in the light of specimens collected by myself on low prairies near Windom, Minnesota, 1 July, 1898.

It was further noted by me this season, in the field, that while the flowers of *L. spicata* are fragrant, those of both *L. leptostachys* and *L. hirtella* are wholly scentless.